APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR and acting AGRICULTURIST - - -	WM. SAUNDERS, LL.D.
HORTICULTURIST - - - - - -	W. T. MACOUN
CHEMIST - - - - - - -	F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST - - -	JAS. FLETCHER, LL.D.
POULTRY MANAGER - - - - - -	A. G. GILBERT
SUPT. EXPERIMENTAL FARM, Nappan N.S. - -	R. ROBERTSON
HORTICULTURIST* " " " - -	W. S. BLAIR
SUPT. EXPERIMENTAL FARM, Brandon, Manitoba -	S. A. BEDFORD
" " Indian Head, N.W.T. -	ANGUS MACKAY
" " Agassiz, B.C. - -	THOS. A. SHARPE

FOR

1898 - 1901

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST
EXCELLENT MAJESTY
1899

[No. 8b—1899.]

Office Building and Museum of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

---o---

OTTAWA, 1st December, 1898.

SIR,—I beg to submit for your approval the twelfth annual report of the work done and in progress at the several Experimental Farms.

In addition to the duties devolving on me as Director of the Experimental Farms, I have also continued to carry on the work of the Agriculturist and have prepared for the present report particulars of the results of the experiments conducted at the Central Experimental Farm with field crops and stock. You will also find appended reports from the following officers of the Central Experimental Farm: From the Horticulturist, Mr. W. T. Macoun; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. Reports are also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson. Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head; and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific investigations in the chemical laboratory and the information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction.

In the report of the Entomologist and Botanist there will also be found particulars of the experiments and observations made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms is a gratifying evidence of the desire for information among this class of the community, also of the high esteem in which these records of the work of the farms are held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit grower and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS,

Director Experimental Farms.

To the Honourable

The Minister of Agriculture,

Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR AND ACTING AGRICULTURIST.

(*WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.*)

In submitting the twelfth annual report of the work done on the Central and Branch Experimental Farms, attention is called to the steady extension of the operations undertaken and to the multiplicity of the details involved. In the planning of the different series of experiments to be undertaken, new material is added from year to year, and their scope is constantly widening. During 1898 the Experimental Farms have shared in the general success which has attended agricultural operations throughout Canada, and good crops have been harvested at all the farms excepting that for the Maritime Provinces, the harvest has brought returns well above the average, while at Nappan, Nova Scotia, where the climatic conditions were less favourable, the crops may be said to have given a fair average yield.

With the growing interest manifested in the mission and work of these farms, many inquiries are made from time to time as to the agricultural conditions existing prior to their establishment, also as to the size and location of each farm, the character of the land, and the area under cultivation. Many particulars are also sought in reference to the general objects in view in the conduct of the work and the progress made along different lines at each farm. To give such inquirers the information sought, brief reference will here be made to the state of agriculture in Canada during the earlier history of this country and some particulars presented regarding each of the Experimental Farms.

AGRICULTURE IN CANADA IN EARLIER TIMES.

It had long been recognized by the more thoughtful part of the community that the early practice of farming in Canada had been wasteful. It had consisted mainly of efforts to take all that could be conveniently got from the land in crops without returning any sufficient equivalent. Such methods had resulted in exhaustion, which although fortunately not complete was so far accomplished that large areas of land in different parts of the early settled portions of the country on which fine crops of wheat had been grown for many years had ceased to give satisfactory returns, and had been abandoned to pasture and other purposes, while new fields had been sought for the cultivation of this valuable cereal so necessary for man's sustenance.

Until recent times it had not been generally understood that every crop grown takes from the land on which it has been produced, certain ingredients known as plant food, and that where repeated drafts are made on this store of nutrition, without making corresponding returns, such soil, no matter how fertile it may have been, will sooner or later, become so far exhausted as to cease to produce profitable crops.

Fortunately the stores of fertility in good soil are large, and are mainly held in insoluble forms, which can only be brought into soluble and available conditions very gradually. To bring this about the conditions must be favourable. The land must be diligently worked, to expose the component parts in turn to the action of air and sunshine which promote the growth of certain ferments and bacterial forms, which take an active part in this transformation. Wasteful farming is almost always associated with a negligent treatment of the land, ploughing being scanty, cultivation practically abandoned, and the crops largely left to take care of themselves. Under such treatment nature refuses to open her stores of fertility and the indolent farmer realizes such small returns, that farming with him soon ceases to be a paying occupation. When an industrious and careful occupant comes into possession of such a worn out farm and ploughs deeply and cultivates often, gives regular dressings of reasonable quantities of manure, and otherwise adds to the fertility of the land by the occasional ploughing under of green crops of clover, and further follows a judicious rotation of crops, the fertility of such land will soon be so far restored that the toil of the husbandman will receive a liberal reward.

CONDITION OF AGRICULTURE IN THE LAST DECADE.

Early in the last decade agriculture in Canada was very much depressed. In 1884 the House of Commons appointed a special commission to inquire into this important industry and to suggest means for its advancement. Evidence was taken from experts in different parts of the country and opinions obtained from many practical farmers. The general opinion was to the effect that farmers were much in need of information in reference to many branches of their calling, and that agriculture in Canada might be much advanced if some means were adopted whereby the farmer might be instructed how best to overcome the difficulties which surround his occupation, by practical demonstrations and the free circulation of suitable literature; and as a means to this end the establishment of Experimental Farms was recommended.

ESTABLISHMENT OF EXPERIMENTAL FARMS IN CANADA.

No action was taken on this suggestion until the latter part of 1885, when Sir John Carling, who had been recently appointed Minister of Agriculture, took steps to bring about the organizing of these institutions in Canada. Inquiries were made as to the methods adopted in working experimental farms and stations in other countries and the writer was instructed to visit a number of such institutions then existing, to prepare a report and to make recommendations as to the form which it seemed most desirable this work should assume in this country. This report was prepared and distributed to Parliament in February, 1886, when an Act was introduced and passed with the concurrence of both sides of the House authorizing the Government to establish a Central Experimental Farm and four Branch Experimental Farms in different parts of Canada.

With the appointment of the Director in October, 1886, the work was begun. Sites for the farms were chosen, officers were appointed and most of the farms were fairly well equipped within two years from that date and all doing good work in their respective spheres of usefulness.

IMPORTANT LINES OF WORK UNDERTAKEN.

Since the primary object in the establishment of these farms was to assist the farmer in his endeavours to overcome the difficulties attendant on his work and to adopt such measures as were likely to result in making farming in this country more profitable, much attention was given from the beginning to those subjects which lie at the foundation of successful agriculture. Among the most important of these are the maintaining of the fertility of the soil, so as to provide for a succession of good crops without

exhaustion; the determining of the best methods of preparing the land for different crops in the several climates of the Dominion; the finding out the best time for the sowing of seed and the ascertaining by repeated tests which are the most profitable varieties of grain, fodder plants and roots to grow, taking into consideration productiveness, quality and earliness of ripening.

SATISFACTORY PROGRESS MADE.

During the past eleven years a wonderful change has taken place in the methods of farming in this country. Instead of selling the coarse grains and thus shipping away the plant food which these crops have taken from the land, a very large proportion of these, associated with suitable fodders, are now fed to cattle, swine and sheep and are thus converted into dairy products, beef, pork, and mutton; and by this method a large part of the fertility taken from the land by the crops has been restored to the soil in the manure. The great value of barn-yard manure is now generally recognized: it is much better cared for, and the most economical methods of handling and using it are more generally practised. The practical lessons taught by the experiments which have been conducted at the Experimental Farms, have been turned to a useful account and much solid advancement has been made.

In the meantime the occupation of farming has been elevated in the eyes of the community. It is no longer looked upon as a sort of drudgery, suited to the dull and slow-going, but is now regarded as a suitable field for the higher intelligence of more cultivated minds. It is recognized as a calling requiring much skill to conduct it successfully and as giving ample scope for the exercise of the most active and earnest minds, and one in which information of almost every sort may be turned to practical account. A few figures will illustrate the progress which has been made along the lines referred to. In 1884 the value of the cheese exported from Canada was $7,251,989; in 1898 it was $17,572,763. During the same period the value of the butter exported has nearly doubled. The exports of cattle have also increased considerably, while the trade in pork has made a phenomenal growth. In 1884 the value of the exports of hams, bacon, pork and lard was less than one million dollars; in 1898 they amounted to more than 8 million dollars.

CENTRAL EXPERIMENTAL FARM.

Many useful lines of work have been carried on at each of the Experimental Farms, but the larger part of the special work of investigation has been done at the Central Farm. As this institution was intended to serve the purposes of a central bureau of information and to meet the requirements of the two most important provinces, Ontario and Quebec, a site was chosen near the boundary line between these provinces where the climate fairly represents the larger part of their area. This farm is located at Ottawa about three miles from the Parliament buildings and consists of 465 acres in all, which is divided by a public road, 400 acres lying to the west and 65 acres to the east of that road. On the 400 acres the buildings are located, which include an office building and museum and a chemical laboratory. A large barn consisting of a central portion, and two wings, with silos at one end having capacity for 350 tons of ensilage. The lower story of this building being on a level with the barn-yard affords accommodation for a considerable number of cattle, while one of the wings is occupied by the pure bred bulls and the other with the working horses. There is also a piggery, a dairy building and poultry-houses; also a sheep building in process of construction. An implement shed, granary and tool-house, a large root-house, and a conservatory with houses for seed testing and seed distribution. There are also several dwellings used as residences by some of the officers and men in charge of the several branches of the work. The soil of this farm varies much in its character in different parts, some portions are heavy clay loam, some a friable clay loam with more or less sand intermixed. The larger part, however, consists of varying

qualities of sandy loam ranging from a heavy loam to one of a light character. About 328 acres of this land is devoted to farming purposes and experiments with farm crops, 42 acres to the testing of fruits and vegetables, 20 acres to the growing of timber trees and about 10 acres to the buildings and the plantations about them of ornamental trees shrubs and plants, sample hedges, &c.

ARBORETUM AND BOTANIC GARDEN.

The 65 acres on the east side are devoted to the purposes of an Arboretum and Botanic Garden where economic and ornamental trees, shrubs and plants have been brought together from all countries with cold or temperate climates, where they are tested side by side and their hardiness and usefulness determined. The plantations of trees and shrubs now include nearly 2,500 species and varieties and about 1,100 varieties of perennial plants are growing in the borders devoted to this purpose. In the orchards about 1,200 varieties of fruits are under test, while the trial plots and fields of grain, fodder crops and roots, include a very large number of different sorts gathered from many distant countries and supplemented by many promising varieties which have been produced on the experimental farms by cross-fertilizing and selection.

PRODUCTION OF NEW VARIETIES OF CEREALS.

Among the many lines of scientific investigation carried on at the Central Farm none have attracted more general attention than the work done in the production of new varieties of cereals by cross-fertilizing and hybridizing. Since the Experimental Farms were established more than 700 new sorts have been so produced. Some of the varieties of grain used as a basis for this work have been brought from the northern parts of Russia, others from high altitudes in the Himalaya Mountains in India. In these localities some of the earliest ripening varieties of grain are found. These have been crossed with standard sorts of the highest quality and productiveness with the object of producing new varieties combining the high quality and productiveness of the one parent with the earliness of the other.

After careful test all those of less promise are rejected, but there are still under trial more than 200 varieties of these hybrid and cross-bred sorts consisting of wheat, barley, oats and pease. Some of these new kinds have produced heavy crops for several years past and seem likely to occupy a prominent place among the best sorts in cultivation. Many new fruits have been similarly produced, especially of hardy varieties likely to be useful in the Canadian North-west.

DIVISION OF WORK.

The Director, who supervises the work of all the Experimental Farms, resides at the Central Farm but makes personal inspection of the branch farms at least once a year. For several years past the Director has also carried on the agricultural work at the Central Farm, such as the field experiments with cereals, fodder crops and roots, and the feeding experiments with steers, milch cows and swine, also the work of the dairy. Associated with the Director are the following officers :—

The Horticulturist who takes charge of the experiments with fruits and vegetables and acts as Curator of the Arboretum.

The Chemist, who makes analyses of grasses and other fodder crops to ascertain their feeding value at different periods in their growth. He also analyses soils and fertilizers and determines the purity of water supplies on farms, and conducts much other useful chemical work bearing on agriculture.

The Entomologist and Botanist, who carries on investigations in reference to injurious and beneficial insects and noxious weeds and tests the value and usefulness of many native and imported grasses for hay and pasture, also the relative merits of other fodder plants. Experiments are also conducted under this officer in bee keeping.

View of part of Shrubbery on the Central Experimental Farm at Ottawa, Ontario.

The Poultry Manager, who carries on experiments with many different breeds of fowls to find out the best sorts as egg layers, and the best for table use, also the most satisfactory crosses for rapid growth and early laying, and the best and most economical methods of feeding.

There is also a Farm Foreman who directs the labour of the workmen and teams, an Accountant and a suitable office staff for conducting the large correspondence, both in English and French, which is carried on with farmers in all parts of the Dominion.

The barns are well supplied with milch cows and steers suitable for the carrying on of experiments relating to the production of milk and beef. Some useful pure-bred bulls are kept at this farm for breeding purposes, and for the improvement of stock in the district. The piggery contains a good selection of animals, representing the most useful breeds of swine. Many experiments are carried on each year in the breeding and feeding of these different classes of animals, and the information gained by these tests has been of much practical value to the farming community.

EVIDENCE OF PROGRESS.

Evidence of the progress made in the growing of farm crops under the improved methods adopted at the Central Experimental Farm at Ottawa is furnished by a comparison of the average yields of grain obtained during the early years with those of more recent ones. The years 1889, 1890 and 1891, the three first after this farm was fairly established, when compared with 1896, 1897 and 1898, show the following results:—

	1889-90-91. Per acre.		1896-97-98. Per acre.		Gain in recent years. Per acre.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Oats, average crop for three years	32	17	56	6	23	13
Barley " "	31	6	43	13	12	7
Wheat " "	15	19	20	9	4	50

These additions in the crop have been gained by a moderate use of fertilizers, and the ploughing under of green crops, the more thorough working of the land, early sowing and the selection of more productive varieties for seed. All these factors have assisted in bringing about this gratifying result. The number of varieties under test in the early years averaged as follows: oats, 28; barley, 23; spring wheat, 28; in the later years, oats, 62; barley, 34, and spring wheat, 39.

When we consider that the addition of one bushel of each of the three cereals named to the average crop of the province of Ontario alone, would add nearly one million dollars to the earnings of the farmers, the significance of these figures becomes apparent.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

This branch farm, designed to serve the purposes of the three Maritime Provinces, Nova Scotia, New Brunswick and Prince Edward Island, was located at Nappan, in the County of Cumberland, N.S., on the Intercolonial Railway, about eight miles east of the boundary line between New Brunswick and Nova Scotia, and easily accessible from Prince Edward Island. Its distance from the Central Farm at Ottawa is 743 miles.

About 310 acres are included in this farm, of which nearly 100 acres is covered with wood. The cleared land may be classified approximately as follows: Marsh or dyke land, valuable for the growth of hay, 50 acres; interval or lower upland, 50 acres, and higher upland, 110 acres. The higher land faces the west, and overlooks the inlet from the Bay of Fundy, and commands a good view of the surrounding country. The soil of this farm fairly represents the better class of farms on the border line of the two provinces, and for a long distance on either side. It is chiefly clay loam, more or less

mixed with sand, becoming heavy or light as clay or sand predominates, with some parts gravelly, and having a subsoil varying from clay to gravelly clay. The advantages embodied in this location include variety of soil, partial shelter from prevailing winds, a central location and nearness to the main line of travel.

WORK UNDERTAKEN.

Work was begun on this farm in the spring of 1887, Mr. Wm. M. Blair acting as Superintendent. Under his management the farm was much improved. A large area of land was drained, and the great value of underdraining in the Maritime Provinces demonstrated. Much useful experimental work has been carried on with grain, roots, grasses, Indian corn and other fodder crops, orchards have been planted, and belts and clumps of ornamental trees and shrubs placed so as to act as wind-breaks and to ornament the grounds around the buildings. Suitable buildings have been provided for carrying on the work, including a large barn, a stable, piggery, poultry building and an implement shed, also residences for the Superintendent, Horticulturist and herdsman.

CHANGES IN STAFF.

In 1896, after nine years of useful service, Mr. Wm. M. Blair resigned his position as Superintendent, and Mr. Geo. W. Forrest was appointed as his successor. Mr. W. S. Blair acting as Horticulturist. Mr. Forrest remained in office one year, when on his resignation the present Superintendent, Mr. R. Robertson, received the appointment. Since Mr. Robertson took office, further improvements have been made in the farm buildings, the area of cleared land has been increased and the dairy herd much improved by the purchase of a number of excellent milking cows. The production of milk throughout the year for dairy purposes has become a prominent feature in the work of this farm. Some further experiments have also been conducted in the fattening of steers. The instructive tests made under the former superintendents in the growing of cereals have been continued, and much attention given to the growing of fodder plants, grasses, roots and potatoes for the production of which the climate is favourable.

HORTICULTURAL BRANCH.

In the horticultural branch, many new varieties of fruit have been added to those under test. A large number of experiments have been conducted with vegetables and further additions made to the ornamental trees, shrubs and plants under trial at this farm.

EXPERIMENTAL FARM FOR MANITOBA.

The Experimental Farm organized for the benefit of the farmers of this province is located at Brandon, which is 132 miles west of Winnipeg and 78 miles east of the Manitoba boundary. The distance from the Central Farm at Ottawa is 1,437 miles. This farm is about 1½ miles from the city of Brandon, and contains about 675 acres. A part of the land lies in the valley of the Assiniboine River, and part of it consists of bluffs and higher table land above the bluffs. The valley land, which varies from 20 to 30 feet above the usual level of the river, has a rich dark clay loam soil and a subsoil of clay. Leaving the river the slope upward is continued, the soil gradually changing to a dark sandy loam averaging from 12 to 15 inches deep with a subsoil varying from sandy to clay. The whole area of land from the river to the foot of the bluffs which form the boundary of the valley, is over 500 acres. The bluffs vary in their inclination, some rise with a gradual slope to the top while others are more precipitous, the spaces between them being broken up into ravines of varying width in which grow a consi-

derable variety of shrubs and plants and some trees, chiefly poplar and scrub oak. The soil on these slopes is a sandy loam, much of it of good quality and from 9 to 15 inches deep resting on a gravelly or gravelly clay subsoil.

Some of the higher land above the bluffs—of which there is in all about 100 acres—is of poorer quality, mixed with more or less gravel, other parts, however, of this land are covered with a dark, sandy loam of good quality. This farm has many advantages. It has a large area of soil which fairly represents the great grain-growing areas in Manitoba, it has also that variety of soils which makes it very suitable for the carrying on of experimental work, and has also the advantage of an abundant supply of spring water. It lies in the centre of one of the large grain-growing districts and is easily accessible to all the more settled portions of the province by rail. The situation of the farm is commanding and it can be seen from the city; a good view of it is also obtained from the main line of the Canadian Pacific Railway for several miles west of Brandon.

WORK DONE AND IN PROGRESS.

Possession of this farm was had in the early part of July, 1888. Mr. S. A. Bedford, who had resided many years in Manitoba and the North-west Territories and had been a successful farmer, was appointed Superintendent and has conducted the work ever since to the great satisfaction of the farmers of the province.

Here much attention is given to methods of treatment of land for crop, different methods of sowing and the sowing at different depths, to find out which gives the best results. Many varieties of cereals have been tested to ascertain which are best adapted to the climate and the trial plots of a large number of varieties of the more important farm crops have been conducted here for some years past, as at the other farms, to gain information as to their relative productiveness and earliness.

Experiments have also been made with remedies for the prevention of smut in grain with much success, also in the growing of flax, millets and Indian corn for ensilage. The value of many native and imported grasses for hay and pasture has been tested and satisfactory conclusions reached. Other fodder plants and fodder mixtures have also been tried, including the growing of mixed cereals and cutting and curing them while green as hay, and it has been shown that by this method any farmer can provide at very little cost or labour, a large quantity of excellent fodder material on his own farm.

Bulls of the most serviceable breeds are kept for the improvement of stock. Experiments have also been made in the feeding of milch cows and steers to learn the best and cheapest methods of producing milk and beef from the fodders most generally available to the farmers of Manitoba.

TESTING OF FRUIT AND FOREST TREES, AND SHRUBS.

Since this farm was established a large number of the hardiest varieties of fruits obtainable have been tested there, and while many sorts of small fruits have succeeded well, very little success has yet attended the efforts made to grow the larger fruits. Experiments are, however, still in progress along this line. Much success has followed the planting of forest trees for shelter and large wind breaks have been established. The main roads have been planted with avenues, and many different sorts of rapid growing trees have been used to form hedge-like inclosures which furnish excellent protection for small fruits and such other crops as are apt to be injured when planted in exposed positions. Much attention has also been given to the growing of ornamental trees and shrubs of which more than 200 varieties of those tested have been found hardy in this climate. The work in all its branches has been most helpful to the farmers residing in that province.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

Since by far the larger part of the land open for settlement on the North-west plains consists of open prairie, when selecting the site for an Experimental Farm for this part of the Dominion, it was thought best that a piece of bare and open prairie land should be chosen for this purpose. The land selected was a section adjoining the town of Indian Head, in Eastern Assiniboia. Indian Head is on the main line of the Canadian Pacific Railway, 44 miles east of Regina, the capital, 104 miles west of the Manitoba boundary, 105 miles north of the boundary line between the United States and Canada, and 1,618 miles distant from the Central Experimental Farm at Ottawa. The farm chosen consists of 680 acres and lies on the north side of the railway which it skirts for about a mile. The soil is of excellent quality. The north half of the section is covered with a black friable clay loam, mixed with a little sand and varying in depth from one to three feet with a yellowish brown clay subsoil. The soil on the larger part of the south half is a heavy clay loam with portions (amounting in all to about 100 acres) of sandy loam. Through this section, running in a winding and irregular manner are two coulées or ravines, in one of which a small creek flows during the early spring months, which is fed by a chain of small lakes six miles distant. This creek dries up during the summer, but by erecting two dams across this ravine a small lake has been formed, where a good supply of water is retained, ample for the requirements of stock and for general farm purposes throughout the season.

The relatively short distance, 182 miles, between this farm and the site chosen for the Experimental Farm for Manitoba naturally raises the question as to the necessity for two experimental farms so near each other. The Brandon site fairly meets the requirements of the province of Manitoba, also the country for a few miles beyond the boundary line, but west of this changes begin to take place in the climate, which become more marked after travelling forty or fifty miles. From thence westward as far as general settlement has been made, the rainfall is usually less than in Manitoba, and occasional hot winds prevail during the summer season. Strong winds also during the spring season are more prevalent. These and other climatic peculiarities compel the farmers in the Territories to vary their methods in treating the soil to prepare for crop. Much of the soil also is different in its texture and character, and this feature is fairly represented by the land at Indian Head. Further, the Indian Head farm was an open prairie without tree or shrub, while the Brandon site was partly a valley farm with sheltered ravines in the bluffs, clothed with shrubs and small trees.

THE GROWING OF FOREST TREES ON THE NORTH-WEST PLAINS.

The question of the growing of forest trees for shelter is of great importance to the settler on the open plains in the North-west, and while experiments carried on at Brandon would be of value to most of the farmers in Manitoba, they would not always be a safe guide to those in the North-west Territories. The differences in climate, soil and situation between these two sites were thought sufficient to justify the establishment of the two farms, and the experimental operations in agriculture, horticulture and forestry which have been carried on since these farms were established has given a vast amount of useful and practical information most helpful to the farmers in the North-west Territories which has enabled them the better to meet the varying conditions to which they are individually subjected.

SITUATION AND SOIL.

The situation at Indian Head is central for the farmers located in the North-west. It is in the midst of a large and thriving settlement extending to the Qu'Appelle River, and beyond this north for about 25 miles through the Pheasant Plains. The country is also settled south of the railway for about 10 miles and the farm is accessible from all points in the Territories either by railway or trails. The soil is of that varied character which

makes it specially useful for experimental purposes, part of it is representative of the clay and sandy loams to the east, also of the areas which lie to the north and north-west, while the heavy clay loam on the south half of the section, although somewhat different in colour and texture, sufficiently represents the large belts of clay lands to the west and south-west.

Possession of the Indian Head farm was had early in the spring of 1888, when work was at once begun. Mr. Angus Mackay, who was one of the early settlers in that country and a successful farmer, was chosen as Superintendent and under his judicious and careful management excellent progress has been made. The farm was fenced the first season, and land prepared for crop in 1889. To meet the need for shelter on this open prairie land, tree planting on a fairly large scale was begun as soon as practicable, and although at first progress was rather slow, the trees first planted soon formed more or less protection for those put in subsequently, and now all are doing well. A shelter belt 100 feet wide, made by planting the trees 5 feet apart each way, has been located along the west and north boundaries for 1¾ miles. A large number of trees have also been planted in blocks varying from half an acre to five acres in extent, also in avenues and in hedges and hedge inclosures, and there are now growing on this farm more than 100,000 trees.

EXPERIMENTS AND THEIR RESULTS.

The results of the experiments carried on in the treatment of land to prepare it for crop have demonstrated the importance of the summer-fallowing of land in this part of the Dominion, which consists of early summer ploughing and several subsequent harrowings to destroy weeds. This treatment conserves the moisture in the land and puts it in the best condition for early sowing the following spring. Different methods of sowing have been practised, also the sowing at different depths and with different quantities of seed per acre, and much practical information has been gained of great value to the settlers. Preventives of smut in grain have also been tried here with much success. Many tests are also made each year with a large number of different sorts of cereals, fodder crops and roots to find out those which are the most profitable to grow in this climate. The growing of grasses, mixed grain crops and spring rye to be cut green and cured as hay has been carried on with much advantage. In this relatively drier climate the value of good grass for hay and pasture can scarcely be over-estimated, and among the most important of all the results gained by tests on this farm are those which have established the value of the Awnless Brome grass, *Bromus inermis*, in the North-west. This grass is very hardy, is a strong grower, endures drought well, makes a very early growth in the spring and yields fine crops of excellent hay very nourishing for cattle. Large quantities of the seed of this useful grass have been ripened at Indian Head and Brandon, and several thousand sample bags of about 1 lb. each have been sent free to farmers in different parts of the North-west Territories and Manitoba for trial, and the reports received regarding the general usefulness of this grass are most satisfactory.

Experiments have also been conducted in the feeding of stock, the fattening of swine and the management of poultry. Male animals are also kept at this farm which have been very serviceable in improving the character of the stock in that part of the Territories. Many varieties of small fruits have been successfully grown at Indian Head, but of the larger fruits tried none have yet succeeded; experiments with these fruits are however still going on. Many species and varieties of economic and ornamental trees and shrubs have been tested here, and of those tried about 150 species and varieties have proved hardy.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

The most westerly and the last chosen of all the Experimental Farms was that selected as a site for the conducting of experiments likely to prove useful to the farmers of British Columbia. This was located at Agassiz in the coast climate of that province, about 70 miles east of Vancouver and 62 miles from New Westminster, near which place lie the fertile delta lands of the Fraser estimated at from 75,000 to 100,000 acres. Port Haney is distant 44 miles, where by crossing the river the agricultural municipality of Langley is reached. It is 28 miles to Mission, the terminus of the railway to Washington and California, and from this point river steamers run up the Fraser to the farming districts of Sumas and Chilliwack. Eastward the distance to Hope is 18 miles, to Yale 32 miles and to Lytton 86 miles, and near this latter place the drier central area of land in British Columbia begins. The distance from Ottawa to Agassiz is 2,715 miles.

In selecting a site for this farm it was thought desirable that the land should be of fairly good quality, combining an area of meadow land suitable for stock and the growing of grain, with higher meadow and bench lands, adapted for fruit growing. That the land should be high enough above the banks of adjacent rivers to prevent its being overflowed during the highest floods, also that it should be accessible by rail and water. It was further desired that the location should be central, and the capabilities of the farm fairly representative of the greater part of the farming lands in the coast climate of this province.

SITUATION, CONDITION AND SOIL.

The land chosen at Agassiz was found to have most of the advantages desired. The part purchased consisted of about 300 acres of valley land opposite the railway station at Agassiz, and extending eastward, its southern boundary fronts on the line of railway for nearly half a mile. The eastern boundary lies along the road leading to the Harrison Hot Springs, which are about 5 miles distant. About 35 acres of this land had for a time been under partial cultivation but was now partly covered with scrub. On about 200 acres of the land the larger trees had been cut and removed; the stumps however were left in the ground and about them had sprung up a strong growth of young trees and scrub. Nearly 50 acres were covered with fine timber, chiefly Douglas spruce, *Pseudotsuga Douglasi*, with some cedar, *Thuya gigantea*. There were also a few acres of higher bench lands at the rear of the farm partly wooded, which would be very suitable for fruit growing. The farm is protected on the north by a series of rocky heights ranging from 900 to 1,200 feet in altitude, on which there are many patches of bench land, some of them covering a considerable area. On the summit of this ridge there is also a large piece of comparatively level land with a good soil, of which use can no doubt eventually be made. Eight hundred acres of this broken mountain land, which was still in the hands of the Government, was added to the valley land composing the farm, making 1,100 acres in all.

The soil of the land in the valley varies from a good sandy loam, with occasional patches of gravel, and sandy loam mixed with clay, to a loam almost wholly clay; from 9 to 12 inches in depth. The subsoil is porous, sandy in some places, in others a sandy clay resting on gravel which is everywhere found from 4 to 8 feet below the surface and affords good natural drainage. All of this land is sufficiently elevated to prevent its being overflowed by the Fraser River even in the highest floods.

Possession of this farm was not had until September, 1889, when on the 19th of that month, work was begun under the superintendence of Mr. Thos. A. Sharpe, a farmer with much experience, who has shown himself to be an energetic, capable and efficient officer. During the nine years which have passed since the work on this farm was begun, much progress has been made. A large area of land has been cleared and nearly 150 acres in all, brought under cultivation.

PLANTING OF LARGE TRIAL ORCHARDS.

The climate here is very suitable for the growing of fruit, and as the fruit industry is assuming large proportions and promises to become one of great importance to this province, to aid the fruit growers in the work of selecting the best and most profitable sorts for planting large trial orchards have been established on the Experimental Farm, for the purpose of testing side by side with Canadian sorts, the fruits of all other countries with similar climates, so that reliable information as to the most promising and useful varieties for this climate, may be available to guide the planter in his selection.

Already about 2,500 different sorts have been brought together and are being tested, not only in the orchards which have been established in the valley lands, but also on the bench lands on the mountain side, where four orchards have been planted at different heights from 150 to 1,100 feet, containing in all about 900 trees.

On the sides of the rocky heights forming the background of the farm as well as on the level land, there have also been planted a large number of forest trees, especially those representing the more valuable hardwoods of the east, such as black walnut, butternut, hickory, elm, ash and oak, and many of these are making good growth. The forests of British Columbia are deficient in hardwood timber trees and if these can be grown to advantage in that climate on rocky hill-sides, such as are of no value for agricultural purposes, this branch of tree culture may become a profitable industry. Many different sorts of ornamental trees and shrubs are also under trial.

OTHER LINES OF WORK CARRIED ON.

As at the other branch farms, many useful lines of work have been carried on in the cultivation and testing of different sorts of grain, fodder plants and roots to find out those best adapted to the climate of this country. Trial plots have also been established for several years to gain information as to the best time for the sowing of different sorts of farm crops. Many experiments have also been tried with different breeds of cattle, swine and poultry. A large number of varieties of vegetables and flowers are also tested every year, and thus the work is made helpful and interesting to all classes of the community.

GENERAL WORK OF THE EXPERIMENTAL FARMS.

Among the different lines of work which have been carried on at all the Experimental Farms, but more largely at the Central Farm may be mentioned the distribution of samples of grain for the improvement of seed. These are sent out by mail free on application, in sample bags weighing three pounds, one sample only being sent to each farmer. More than 100,000 farmers have received such samples during the past ten years. More than 12,000 packages of seedling trees, shrubs and plants, and more than six tons of the seeds of hardy trees suitable for the North-west have been sent out in like manner, also several tons of the seed of the Awnless Brome grass, *Bromus inermis*. The tree seeds, and the Brome grass have been distributed in sample bags of one pound each. An annual report is published containing particulars of the work done at each farm, and this report is sent from the Central Farm to every farmer in the Dominion who asks for it. More than 50,000 copies are now distributed each year. Occasional bulletins on special subjects are also issued from time to time which reach a large proportion of the most intelligent farmers in the country. The officers at all the Experimental Farms attend every year, many of the more important meetings of farmers held in different parts of Canada, where opportunities are afforded of giving further explanations regarding the work conducted and the results achieved from year to year.

EXPERIMENTAL WORK

CONDUCTED AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA ONTARIO.

EXPERIMENTS WITH OATS.

Sixty-nine varieties of oats have been tested in the uniform trial plots during the season of 1898 in order to gain information regarding their relative yield, earliness of ripening and other characteristics. They were all sown from the 14th to 16th of April on plots of $\frac{1}{40}$th acre each. The previous crop was wheat. The soil was a sandy loam of good quality which received a dressing of barn-yard manure, about 12 tons per acre, during the winter of 1895-96, the manure being placed fresh on the frozen ground in small piles of about half a cart load each and spread in the spring. The land was gang-ploughed shallow in 1897 shortly after harvest to start shed grain and weed seeds and ploughed again later in the autumn about 8 inches deep, disc-harrowed twice in the spring of 1898 and harrowed twice with the smoothing harrow before sowing. The seed was sown at the rate of two bushels per acre and the land was rolled after sowing before the grain came up.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre		Weight per Bush	Rusted.
				In.		In.		Bush.	Lbs.	Lbs	
1	Hazlett's Seizure	Aug. 1..	108	50–55	Stiff..	9–10½	Branching	89	14	37	Slightly.
2	Joanette	" 2..	109	38–46	Weak	7½–8½	" .	86	16	36	Considerably.
3	Brandon	" 3..	110	50–55	Stiff..	10½–12	Half sided	80	30	36¾	"
4	Oderbruch..........	" 2..	109	50–57	Weak	8½–10½	" .	80	30	37½	"
5	Golden Beauty......	July 30..	106	48–52	Stiff..	9–10	Branching	80	20	35	"
6	Black Mesdag.	" 27..	104	50–55	Medium..	8½–10	" .	80	...	34	"
7	Early Golden Prolific.	" 30..	105	46–50	Weak	9–11	" .	79	14	36¼	Slightly.
8	Improved Ligowo....	" 27..	106	44–48	Stiff	8½–9½	" .	78	32	34	Very slightly.
9	Holland....	Aug. 8..	115	42–46	Stiff..	8–9	Sided.....	78	18	36	Badly.
10	Flying Scotchman....	July 30..	107	52–56	Weak ...	10–12	Branching	78	18	38¼	Considerably.
11	Russell.............	Aug. 3..	110	50–54	"	9½–11½	H'lf br'nch	78	8	37	"
13	King................	" 4..	110	50-54	Stiff..	9½–11½	Branching	77	23	38	"
13	Abundance..........	July 30..	107	44–48	Medium..	9–10½	" .	76	26	33½	"
14	Pense....	Aug. 3..	110	47–51	Weak	8½–9½	Half sided	76	26	34	Badly.
15	Banner....	July 30..	105	41–48	Stiff..	8½–9½	Branching	75	30	35½	Slightly.
16	Early Archangel.	" 27..	104	42–50	"	8½–9½	" .	75	30	41¼	"
17	White Giant.........	" 30..	107	42–49	"	8½–10	" .	75	10	35¾	"
18	Master...	Aug. 4..	111	54–58	"	8½–10	Half sided	75	....	39	Considerably.
19	American Triumph...	July 28..	104	41–48	"	9–10	Branching	74	4	34	"
20	Columbus	" 27..	103	42–46	"	8½–10	" .	73	28	35	Very slightly.
21	Newmarket.........	" 27..	103	54–58	"	8–9	" .	73	18	39	Slightly.
22	Wallis.....	" 29..	106	40–46	"	9–9½	" .	73	8	36¼	"
23	Thousand Dollar.....	" 27..	104	40–49	"	8½–9½	" .	72	22	38	"
24	White Schonen	" 27 .	103	42–47	"	8½-10	" .	72	12	33	"
25	Mortgage Lifter.	" 27..	103	50–54	Weak	10–12	" .	72	12	39	Considerably.

OATS—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bush	Rusted.
				In.		In.		Bush.	Lbs.	Lbs.	
26	Early Gothland.....	Aug. 2..	110	50-54	Medium..	8½-9½	Half sided	72	12	39¾	Badly.
27	Milford	" 4..	112	50-56	....	9-11	" .	71	26	36½	"
28	Golden Giant........	" 8..	116	40-44	Stiff..	8-9	Sided.....	70	20	35½	"
29	Kendal.	" 4..	112	42-53	....	7¾-9¼	Half sided	70	20	37	Slightly.
30	Mennonite	July 30..	106	36-39	Weak	7-8	Branching	70	20	34½	Badly.
31	Bavarian............	Aug. 5..	113	40 44	"	7½-9	" .	70	20	36	Slightly.
32	Early Blossom.	" 1..	108	50-54	Stiff..	7½-9	Half sided	70	20	37½	"
33	Oxford..............	July 30..	106	40-48	"	9-11	" .	70	10	36¼	Badly.
34	Olive...............	" 30..	106	50-54	"	8-9½	" .	68	8	37	Considerably.
35	Miller..............	" 30..	106	46-50	"	8½-10	Branching	65	30	38	Slightly.
36	Coulommiers..	Aug. 8..	116	50-54	Weak	10-12	" .	65	30	35½	Badly
37	Buckbee's Illinois....	July 29..	105	40-44	Stiff..	9½-10½	" .	64	8	35½	Slightly.
38	Lincoln.............	July 28..	104	40-44	Stiff	8½-9½	Branching	63	28	35	Slightly.
39	Improved American..	" 28..	104	40-47	"	8½-10	" .	63	18	34½	"
40	American Beauty....	" 28..	104	40-44	"	8-9½	" .	63	18	32	"
41	Doncaster Prize......	Aug. 4..	110	36-41	"	7-8½	" .	63	18	36½	Badly.
42	Early Maine.........	July 30..	106	50-54	"	8½-10	" .	62	32	37	Slightly.
43	Victoria Prize.	" 27..	103	50-54	Medium..	8½-9½	" .	62	22	43¼	Considerably.
44	Winter Gray........	" 27..	103	40-48	Weak	9¼-10	" .	62	22	40	"
45	California Prol. Blk...	Aug. 2..	109	43-48	Stiff	7-8½	Sided.....	62	22	36	Slightly.
46	Bonanza............	July 27..	103	42-46	Weak	9-10	Branching	61	16	40½	Considerably.
47	White Russian.	" 30..	106	40-46	Stiff.. ...	9-10	" .	61	6	36	Slightly.
48	Golden Tartarian....	Aug. 3..	110	44-48	"	8¾-10	Sided. ..	61	6	33½	"
49	Scottish Chief.......	July 27..	103	41-50	Weak ...	9-10	Branching	60	20	42½	Considerably.
50	Holstein Prolific.	" 29..	105	38-42	Stiff..	8-9	" .	60	10	35	Slightly.
51	Imported Irish.....	" 27..	103	42-48	Weak . ..	9-10	" .	60	....	40½	Considerably.
52	Early Dawson.......	" 27..	102	36-40	....	8 8½	....	60	...	40¾	
53	Wide Awake....	July 28..	105	40-46	Stiff..	7½-9	Branching	58	28	35	Slightly.
54	Cream Egyptian.....	" 27..	103	40-48	"	9-9½	Half sided	57	32	42	"
55	Poland.	" 27..	103	42-48	Weak	8-9½	Branching	57	22	38¼	"
56	White Wonder.	" 27..	103	40-44	"	8½-10	" .	53	8	42¼	Considerably.
57	Siberian O. A. C.....	" 28..	104	40-46	Medium..	7-9	" .	52	22	35	Slightly.
58	Black Beauty........	" 29..	104	36-40	Weak	8-9½	" .	51	6	36	"
59	Cromwell...........	" 30..	107	48-52	Stiff..	9-11	Half sided	50	20	40	"
60	Rosedale............	" 30..	106	48-50	"	8-10	" .	50	10	40½	"
61	Welcome............	" 27..	104	49-52	Weak	9½-11	Branching	50	....	43¾	Considerably.
62	Bayonet............	" 30..	105	40-46	Stiff..	10-11	" .	48	28	38½	Slightly.
63	Victoria............	" 30..	105	40-44	"	9½-10½	" .	47	12	33	"
64	Prize Cluster........	" 27..	104	48-42	"	10½-12	" .	47	2	42	"
65	Medal..............	" 30..	106	40-46	Weak	9-10½	Half sided	47	2	36½	Considerably.
66	Rennie's Prize White.	" 27..	103	50-54	"	10-11	Branching	46	26	39	"
67	Abyssinia....... ...	" 29..	105	37-43	Stiff..	8-9½	Half sided	46	26	39	Slightly.
68	Prol. Blk. Tartarian..	Aug. 2..	109	40-45	"	6-7	Sided.....	43	28	36½	"
69	Danish Island.	" 1..	100	32-38	Weak	8-9	Branching	42	12	36	"

FIELD CROPS OF OATS.

Fifteen varieties of oats have been further tested in field crops, covering 62¼ acres in all. The area occupied by each variety and the crops obtained from each sort are given below in the order of their yield. The soil of these fields varied much in quality,

which has materially affected the crops. The Abundance, Wallis, and Siberian which are among the best yielding varieties here stand low in the list on account of the poor quality of the soil on which they were grown.

Name of Variety.	Number of Acres.	Yield per Acre.		Weight per Bushel.
		Bush.	Lbs.	Lbs.
American Beauty	5	82	11	36½
Banner	4	77	31	35
Mennonite	3	64	33	34
Joanette	1¼	63	18	37
Improved Ligowo	1½	62	27	38¼
"	6½	62	10	38¼
Golden Beauty	5	62	31	36
White Schonen	3¾	57	26	36
Wallis	4	57	2	36½
Siberian O.A.C.	3½	57	....	37
"	1½	38	22	37
Bavarian	2½	56	12	36
Abundance	4¾	55	18	36½
Golden Giant	10	54	21	35½
Columbus	3	51	19	34
Early Gothland	5	47	27	39

American Beauty.—5 acres. The soil was a sandy loam of fair quality, a part of it peaty. The previous crop was hay. The land received an application during the winter of about 10 tons of barn-yard manure per acre which was distributed fresh from the barn-yard on the frozen ground in small piles of about one-third of a cart load each, and spread in the spring. It was then ploughed under with the sod about six inches deep and harrowed with the smoothing harrow before sowing. Sown 20th April; 2 bushels per acre; came up 2nd May, and was ripe 29th July. The time to mature was 100 days. Yield per acre, 82 bushels 11 pounds; weight per bushel, 36½ pounds. Length of head, 9 to 10 inches, branching; length of straw, 40 to 48 inches. Made a strong even growth; all standing well. There was no smut, but the leaves were slightly rusted.

Banner.—4 acres. The soil was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was roots. The land was manured in the spring of 1893 with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. It was ploughed in the spring of 1898 about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. Sown 18th April; 2 bushels per acre; came up 30th April, and was ripe 27th July. The time to mature was 100 days. Yield per acre, 77 bushels 31 pounds; weight per bushel, 35 pounds. Length of head, 8 to 10 inches, branching; length of straw, 42 to 48 inches. Growth strong and even; all standing well. There was no smut, and the leaves were very slightly rusted.

Mennonite.—3 acres. Soil a light sandy loam of rather poor quality. This land was manured in 1894 with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was hay. The land was ploughed in the autumn of 1897 about 8 inches deep and cultivated once the following spring, and harrowed once with the smoothing harrow before sowing. Sown 15th April; 1¾ bushels per acre; came up 28th April, and was ripe 25th July. The time to mature was 101 days. Yield per acre, 64 bushels 33 pounds; weight per bushel, 34 pounds. Length of head, 7 to 9 inches branching; length of straw, 40 to 46 inches. Growth strong and even; all standing well. There was no smut, and the leaves were very slightly rusted.

Joanette.—1¼ acres. The soil was part peaty, and part sandy loam. The land was manured in the spring of 1897 with about 12 tons of barn-yard manure per acre. It was ploughed late in the autumn of 1897 about 8 inches deep, and in the following spring it was disc-harrowed once and harrowed twice with the smoothing harrow before sowing. The previous crop was oats cut green for feeding. Sown 21st April; 1½ bushels per acre; came up 3rd May, and was ripe 1st August. The time to mature was 102 days. Yield per acre, 63 bushels 18 pounds; weight per bushel, 37 pounds. Length of head, 7 to 9 inches, branching; length of straw, 34 to 38 inches. Growth medium and even; all standing well. There was no smut, but the leaves were slightly rusted.

Improved Ligowo.—1½ acres. Soil a sandy loam of fair quality which received a dressing of barn-yard manure in the spring of 1896 of about 12 tons per acre. No fertilizer has been applied since. The previous crop was wheat. The land was ploughed in the autumn of 1897 about 8 inches deep, and in the following spring disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. Sown 27th April; 1¾ bushels per acre; came up 7th May, and was ripe 29th July. The time to mature was 93 days. Yield per acre, 62 bushels 27 pounds; weight per bushel 38¼ pounds. Length of head, 7 to 9 inches, branching; length of straw, 38 to 44 inches. Made a strong and even growth; all standing well. There was no smut, but the leaves were very slightly rusted.

Improved Ligowo.—6½ acres. Soil a light sandy loam of good quality. This land was manured in the autumn of 1897 with about 10 tons of barn-yard manure per acre. The previous crop was partly corn and part potatoes. It was ploughed in the autumn of 1897 about 6 inches deep, and the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown 12th April; 1¾ bushels per acre; came up 26th April, and was ripe 25th July. The time to mature was 104 days. The yield per acre was 62 bushels 10 lbs.; weight per bushel, 38¼ pounds. Length of head, 7 to 9 inches, branching; length of straw, 42 to 46 inches. Made a strong and even growth; all standing well. There was no smut, and the leaves were very slightly rusted.

Golden Beauty.—5 acres. Soil a sandy loam of fair quality, a part of it peaty. The previous crop was hay. The land received an application of barn-yard manure of about 10 tons per acre, distributed fresh from the barn yard in small piles of about one-third of a cart load each, during the winter of 1897-98, which was spread in the spring, and ploughed under with the sod about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. Sown 20th April; 2 bushels per acre; came up 2nd May, and was ripe 20th July. The time to mature was 100 days. Yield per acre, 62 bushels 31 pounds; weight per bushel, 36 pounds. Length of head, 9 to 10 inches, branching; length of straw, 42 to 48 inches, made a strong and even growth; all standing well. There was no smut, but the leaves were slightly rusted.

White Schonen.—3¾ acres. Soil a sandy loam of fair quality, which was manured in the spring of 1898, with about 12 tons of barn-yard manure per acre. The previous crop was hay. The manure was ploughed under soon after spreading about 6 inches deep, and the land was harrowed twice with the smoothing harrow before sowing. Sown 30th April; 1¾ bushels per acre; came up 8th May, and was ripe 5th August. The time to mature was 98 days. Yield per acre, 57 bushels 26 pounds; weight per bushel, 36 pounds. Length of head, 8 to 9 inches, branching; length of straw, 38 to 43 inches. Made a strong and even growth; all standing well. There was no smut, but the leaves were very slightly rusted.

Wallis.—4 acres. Soil a sandy loam, rather light but of fair quality, which received a coating of barn-yard manure of about 12 tons per acre in the spring of 1895. No manure or other fertilizer has been applied since, except a good crop of green clover, which was sown

with the previous crop and ploughed under in the autumn of 1897. The previous crop was barley. The ploughing in the autumn was about 8 inches deep, and in the spring of 1898 the land was disc-harrowed once and harrowed twice with the smoothing harrow before sowing. Sown 19th April, 2 bushels per acre; came up 30th April, and was ripe 28th July. The time to mature was 100 days, and the yield per acre was 57 bushels 2 pounds; weight per bushel, 36¼ pounds. Length of head, 9 to 10 inches, branching; length of straw, 42 to 48 inches. Growth strong and even, and all standing well. There was no smut, but the leaves were very slightly rusted.

Siberian O.A.C.—3½ acres. Soil a sandy loam, rather light but of fair quality, which received a coating of barn-yard manure of about 12 tons per acre in the spring of 1895. No manure or other fertilizer has been applied since, except a good crop of clover. Clover seed in the proportion of 10 lbs. per acre, was sown with the previous crop of barley and ploughed under in the autumn of 1897. The autumn ploughing was about 8 inches deep. In the spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown 19th April; 1¾ bushels per acre; came up 30th April, and was ripe 29th July. The time to mature was 101 days. Yield per acre; 57 bushels; weight per bushel, 37 pounds. Length of head, 9 to 10 inches, branching; length of straw, 42 to 48 inches. Made a strong even growth; a few spots lodged. There was no smut, but the leaves were very slightly rusted.

Siberian O.A.C.—1½ acres. This also was adjoining the 3½ acres, and the character of the land was the same. It received a similar application of manure in 1895, and also a dressing of barn-yard manure of about 12 tons per acre in the spring of 1897. In the spring of 1898 it received an application of unleached wood ashes, of about 100 bushels per acre. The previous crop was sunflowers. The land was ploughed in the autumn of 1897 about 8 inches deep, and in the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown 19th April; 1¾ bushels per acre; came up 30th April, and was ripe 29th July. The time to mature was 101 days. The yield per acre was 38 bushels 32 pounds; weight per bushel, 37 pounds; length of head, 8 to 9 inches, branching; length of straw, 38 to 42 inches. Made a medium and even growth; all standing well. There was no smut, but the leaves were very slightly rusted.

Bavarian.—2½ acres. Soil a sandy loam, rather light but of fair quality, which received a dressing of barn-yard manure of about 12 tons per acre in the spring of 1895. No manure or other fertilizer has been applied since, excepting a good crop of green clover which was sown with the previous crop of barley in the spring of 1897, 10 lbs. of Mammoth Red clover seed being used per acre. This produced a thick mat of green growth which was ploughed under in the autumn about 8 inches deep. In the spring of 1898 the land was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown 20th April; 2 bushels per acre; came up 30th April, and was ripe 28th July. The time to mature was 99 days. The yield per acre was 56 bushels 12 pounds; weight per bushel, 36 pounds. Length of head, 9 to 10 inches; length of straw, 42 to 48 inches. Growth strong and even; all standing well. There was no smut, but the leaves were very slightly rusted.

Abundance.—4¾ acres. The soil was part peaty and part sandy loam. The land was manured in the spring of 1897 with about 12 tons of barn-yard manure per acre. It was ploughed late in the autumn of 1897 about 8 inches deep, and in the following spring it was disc-harrowed once and harrowed twice with the smoothing harrow before sowing. Sown 22nd April; 1¾ bushels per acre; came up 3rd May; and was ripe 28th July. The time to mature was 97 days. Yield per acre, 55 bushels 18 pounds; weight per bushel, 36¼ pounds. Length of head, 7 to 9 inches, branching; length of straw, 38 to 44 inches. Growth medium and even; all standing well. There was no smut, but the leaves were very slightly rusted.

Golden Giant.—10 acres. Soil a light sandy loam of rather poor quality. The land was manured in 1895 with about 12 tons of barn-yard manure per acre. The previous crop was oats. It was ploughed very shallow Sept. 1st, 1897, and subsequently cultivated at short intervals as the land was rather weedy, so as to keep down all growth until late in the autumn. In the following spring it was cultivated twice with a large cultivator which stirred the soil nearly six inches deep, and harrowed twice with the smoothing harrow before sowing. Sown 14th April; $1\frac{3}{4}$ bushels per acre; came up 28th April, and was ripe 2nd August. The time to mature was 110 days. The yield per acre was 54 bushels 21 pounds; weight per bushel $35\frac{1}{2}$ pounds. Length of head, 9 to 10 inches; sided; length of straw, 42 to 48 inches. Made a strong and even growth; all standing well. There was no smut, and the leaves were very slightly rusted.

Columbus.—3 acres. This variety was sown adjoining the Golden Giant, and the quality of the soil and the preparation and treatment of the land was the same. Sown 14th April; $1\frac{3}{4}$ bushels per acre; came up 28th April, and was ripe 25th July. The time to mature was 102 days. Yield per acre, 51 bushels 19 pounds; weight per bushel, 34 pounds. Length of head, 8 to 9 inches, branching; length of straw, 38 to 42 inches. Made a medium growth; all standing well. There was no smut, and the leaves were very slightly rusted.

Early Gothland.—5 acres. The soil was a sandy loam of fair quality which received a dressing of barn-yard manure in the spring of 1896 of about 12 tons per acre. No fertilizer has been applied since. The previous crop was wheat. The land was ploughed in the autumn of 1897 about 8 inches deep, and disc-harrowed twice in the following spring and harrowed twice with the smoothing harrow before sowing. Sown 27th April; $1\frac{3}{4}$ bushels per acre; came up 7th May, and was ripe 29th July. The time to mature was 93 days. Yield per acre, 47 bushels 27 pounds; weight per bushel, 39 pounds. Length of head, 8 to 10 inches; half sided. Length of straw, 38 to 46 inches. Made a strong and even growth; all standing well. There was no smut, but the leaves were very slightly rusted.

EXPERIMENTS WITH BARLEY.

During 1898 experiments have been conducted with fifty varieties of barley, of which twenty-two were two-rowed sorts, and twenty-eight six-rowed. These were all sown in plots of $\frac{1}{40}$th acre each. The previous crop was wheat. The land selected for the barley plots was adjoining that used for the test of varieties of oats. The soil was similar and the preparation and treatment of the land the same. These plots were all sown from the 16th to the 18th of April, at the rate of 2 bushels per acre for the two-rowed sorts and $1\frac{3}{4}$ bushels per acre for the six-rowed.

Two-rowed Barley—Test of Varieties.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs	
1 Beaver	July	28	101	40—43	Weak	$3\frac{1}{2}$—$4\frac{1}{2}$	55	20	51	Slightly.
2 Jarvis	"	28	101	50—55	Stiff	4 —$5\frac{1}{2}$	50	4	52	"
3 Danish Chevalier	"	28	101	43—47	Weak	$3\frac{1}{2}$—4	50		$51\frac{1}{2}$	"
4 Canadian Thorpe	"	28	103	40—45	Stiff	3 —$3\frac{1}{2}$	47	14	52	"
5 Dunham	"	26	103	40—48	Medium	$3\frac{1}{2}$—4	46	2	52	"
6 Leslie	"	26	103	41—46	Stiff	3 —$4\frac{1}{2}$	45	40	$52\frac{1}{4}$	"
7 Prize Prolific	"	28	101	32—38	Weak	3 —$4\frac{1}{2}$	43	16	$49\frac{3}{4}$	"
8 Bolton	"	25	98	39—47	Stiff	$3\frac{1}{2}$—$4\frac{1}{2}$	43	6	$51\frac{1}{4}$	"
9 Clifford	"	26	99	42—48	"	4 —$4\frac{1}{2}$	41	32	51	"
10 Victor	"	25	98	42—44	"	$3\frac{1}{2}$—$4\frac{1}{2}$	39	8	$51\frac{3}{4}$	"
11 Kinver Chevalier	"	28	101	36—39	Weak	$3\frac{1}{2}$—$4\frac{1}{2}$	38	16	51	"
12 Thanet	"	28	101	36—38	"	4 —$5\frac{1}{2}$	38	6	$49\frac{1}{2}$	"
13 Nepean	"	26	99	40—45	Stiff	3 —4	37	34	53	"
14 French Chevalier	"	28	101	30—38	Weak	4 —$5\frac{1}{2}$	36	42	51	Considerably.
15 Newton	"	28	103	30—37	Stiff	3 —$3\frac{1}{2}$	36	32	50	Slightly.
16 Fulton	"	27	100	44—48	"	3 —$3\frac{1}{2}$	35	40	51	"
17 Logan	"	27	100	40—47	"	$3\frac{1}{2}$—4	35	20	51	"
18 Harvey	"	27	100	40—43	"	$3\frac{1}{2}$—$4\frac{1}{2}$	33	46	51	"
19 Sidney	"	25	98	44—48	"	$3\frac{1}{2}$—4	33	36	52	"
20 Pacer	"	26	101	40—44	"	3 —$4\frac{1}{4}$	33	6	$52\frac{1}{4}$	"
21 Kirby	"	27	100	30—38	Medium	$2\frac{1}{2}$—3	31	10	$49\frac{1}{2}$	"
22 Gordon	"	27	100	46—48	Stiff	$2\frac{1}{2}$—3	28	16	$50\frac{1}{4}$	"
23 Monck	"	28	103	44—46	"	$3\frac{1}{2}$—$4\frac{1}{2}$	27	34	$51\frac{3}{4}$	"
24 Rigid	"	26	99	40—43	"	3 —4	26	32	$50\frac{1}{4}$	"

Field Crop of Two-rowed Barley.

Canadian Thorpe.—$4\frac{1}{2}$ acres. Soil a sandy loam of fair quality. The land was manured in 1895 with about 12 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. The land was ploughed late in the autumn of 1897 about 8 inches deep, and disc-harrowed the following spring and harrowed twice with the smoothing harrow before sowing. Sown 14th April ; 2 bushels per acre ; came up 26th April, and was ripe 23rd July. The time to mature was 100 days. Yield per acre, 32 bushels 6 pounds ; weight per bushel, $51\frac{1}{2}$ pounds. Length of head, 3 to $3\frac{1}{2}$ inches ; length of straw, 38 to 44 inches ; growth medium ; all standing well. There was no smut or rust.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs	
1	Odessa	July 22	97	44—48	Medium	2½—3¼	58	16	50	Slightly.
2	Pioneer	" 26	101	40—47	Stiff	2½—3½	57	4	50	"
3	Mensury	" 25	100	42—50	"	3—4	55		46	"
4	Royal	" 22	97	34—40	Weak	2½—3½	52	34	50¼	"
5	Mansfield	" 25	100	39—46	Stiff	2—3	51	32	48	None.
6	Blue Barley	" 28	103	32—36	"	2—4¼	50	6	47	Considerably.
7	Yale	" 25	100	40—50	Medium	3¼—4	49	28	50	Slightly.
8	Empire	" 25	100	40—46	"	3¼—4½	49	28	50¼	"
9	Argyle	" 20	95	42—49	Stiff	2½—3½	49	8	49¾	"
10	Stella	" 25	100	40—46	Weak	2½—3½	47	4	51	"
11	Oderbruch	" 21	96	41—46	Stiff	2—3	46	42	52	"
12	Phœnix	" 21	96	41—48	Medium	2¼—3	45		49	"
13	Surprise	" 25	100	40—44	Stiff	2½—3½	44	38	50½	"
14	Claude	" 27	102	35—40	Weak	3—3½	44	8	47	"
15	Nugent	" 25	100	40—46	Stiff	2½—3	41	22	50	"
16	Rennie's Improved	" 16	91	40—45	Medium	2¼—3½	41	12	49	"
17	Summit	" 25	100	42—46	Stiff	2½—3½	40	20	52¼	"
18	Albert	" 25	100	36—44	"	3½—4	40	20	51	"
19	Common	" 26	101	43—48	"	3—3½	40	20	49	None.
20	Trooper	" 22	97	38—43	"	2½—3	38	36	48	Slightly.
21	Success	" 11	87	40—44	Weak	2—2½	37	24	46¼	"
22	Petschora	" 21	96	40—44	Medium	2½—3½	37	24	45½	"
23	Garfield	" 26	99	36—40	"	3—3½	37	14	49¼	"
24	Vanguard	" 16	91	36—39	Stiff	2½—3	36	32	50¼	"
25	Excelsior	" 21	96	40—48	Medium	2½—3½	36	2	46¼	"
26	Brome	" 26	99	40—43	Weak	2½—3	35		50	"
27	Baxter	" 22	97	41—44	Stiff	2¼—3½	35		48	"
28	Champion	" 21	96	40—48	"	2¼—3½	33	16	46	"

FIELD CROPS OF SIX-ROWED BARLEY.

Royal.—7¼ acres. Soil a sandy loam of fair quality, with patches of heavier soil which were partly clay. This land received a dressing of about 15 tons of barn-yard manure per acre in the spring of 1897. No fertilizer has been applied since. The previous crop was corn. The land was ploughed late in the autumn about 8 inches deep and disc-harrowed twice the following spring, and harrowed twice with the smoothing harrow before sowing. Sown 15th April ; 1¾ bushels per acre ; came up 27th April, and was ripe 13th July. The time to mature was 89 days. Yield per acre, 40 bushels 6 pounds ; weight per bushel, 51 pounds. Length of head, 2½ to 3½ inches ; length of straw, 36 to 42 inches. Growth medium and even ; all standing well. There was some smut, but no rust.

Mensury.—4 acres. Soil partly clay loam, partly sandy loam and part peaty. This land was manured in the spring of 1896, with about 12 tons of barn-yard manure per acre. In the spring of 1898 a thick mat of clover was ploughed under. The previous crop was oats, with which the clover was sown at the rate of 10 pounds of seed per acre. In the spring of 1898 it was ploughed about six inches deep, then disc-harrowed and harrowed twice with the smoothing harrow before sowing. Sown 23rd April ; 1¾ bushels per acre ; came up 3rd May, and was ripe 20th July. The time to mature was 88 days. Yield per acre, 46 bushels 41 pounds ; weight per bushel, 45½ pounds. Length of head, 3 to 3½ inches ; length of straw, 38 to 42 inches. Growth strong and even ; all standing well. There was no smut or rust.

Oderbruch.—4 acres. This and the three following plots were adjoining that of Mensury, the soil was similar and the preparation and treatment of the land the same. Sown 23rd April; $1\frac{3}{4}$ bushels per acre; came up 10th May and was ripe 20th July. The time to mature was 88 days. Yield per acre, 44 bushels 30 pounds; weight per bushel, 49 pounds. Length of head, 3 to $3\frac{1}{4}$ inches; length of straw, 36 to 40 inches. Growth medium to strong; standing fairly well. There was no smut and no rust.

Success.—2 acres. Sown 23rd April; $1\frac{3}{4}$ bushels per acre; came up 4th May, and was ripe 16th July. The time to mature was 84 days. Yield per acre, 39 bushels 13 pounds; weight per bushel, 45 pounds. Length of head, $2\frac{1}{2}$ to 3 inches; beardless; length of straw, 36 to 40 inches. Growth medium and even, standing fairly well. There was no smut or rust.

Champion.—2 acres. Sown 23rd April, $1\frac{3}{4}$ bushels per acre; came up 4th May, and was ripe 18th July. The time to mature was 86 days. Yield per acre, 41 bushels 18 pounds; weight per bushel 43 pounds. Length of head, $3\frac{1}{2}$ to $3\frac{3}{4}$ inches; beardless; length of straw, 38 to 44 inches. Growth medium and even; all standing well. There was no smut or rust.

Trooper.—2 acres. Sown 23rd April; $1\frac{3}{4}$ bushels per acre; came up 4th May; and was ripe 22nd July. The time to mature was 90 days. Yield per acre, 40 bushels 13 pounds; weight per bushel, 49 pounds. Length of head, $2\frac{1}{2}$ to $2\frac{3}{4}$ inches; length of straw, 32 to 36 inches. Growth medium and even; all standing well. There was some smut but no rust.

EXPERIMENTS WITH FALL WHEAT.

Twenty-four varieties of fall wheat have been under trial during the past season, most of them in plots of $\frac{1}{40}$th of an acre each. They were all sown on the 7th of September, 1897, and harvested from the 14th to the 26th of July, 1898. The soil was a sandy loam of medium quality which received a dressing of barn-yard manure of about 12 tons to the acre during the winter of 1895-96. This was placed on the frozen land fresh from the barn-yard in small heaps of about half a cart load each and spread and ploughed under in the spring. No manure or other fertilizer has been applied since. The previous crop was pease. The land was gang-ploughed shallow shortly after harvest in 1897 to start shed grain and weed seeds, and ploughed again in September about 8 inches deep and harrowed with the smoothing harrow before sowing. The growth of all the plots was strong and even but three or four of the varieties which gave the smallest crops were more or less winter killed. Most of the grain harvested was unusually fine and plump.

Stanley. Preston.

Cross-bred wheats, produced at the Central Experimental Farm, Ottawa, Ontario. [25]

Fall Wheat—Test of Varieties.

Name of Variety.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.	Rusted.
	Inches.	Inches.		Bush.	Lbs.	Lbs.	
1 Imperial Amber.......	50 to 54	3 to 4	Bearded....	52		62½	Very slightly.
2 Poole...	50 to 55	3½ to 4	Beardless...	50	10	61½	Slightly.
3 Russian Amber.	40 to 46	3½ to 4	Bearded....	48	30	62¼	Very slightly.
4 Velvet Chaff..........	46 to 50	3½ to 4½	"	47	20	62	Slightly.
5 Egyptian Amber.......	46 to 52	3 to 3½	"	42	20	63½	Very slightly.
6 Bonnell or Landreth...	46 to 50	3 to 3½	Beardless...	41		63½	"
7 Dawson's Golden Chaff.	46 to 50	3 to 3½	" ...	41		61	"
8 Standard.	46 to 52	3 to 4	" ...	39	40	62½	"
9 Red Velvet Chaff......	40 to 48	4 to 4½	" ...	39	40	61¼	Slightly.
10 Golden Cross..........	42 to 48	3 to 3½	Bearded....	38		61	"
11 Long Berry Red.......	42 to 49	3½ to 4	"	35	40	61¼	Considerably.
12 Early Ripe............	40 to 47	3 to 3½	"	34	20	61¼	Slightly.
13 Early Genesee Giant...	40 to 46	2½ to 3	"	33	40	62¾	"
14 Jones' Winter Fife.....	46 to 50	3½ to 4	Beardless...	33	20	62	"
15 Tasmania Red	41 to 46	3 to 3½	Bearded....	33	20	62	"
16 Reliable..	40 to 48	3½ to 4	"	33	20	61½	"
17 Egyptian.....	40 to 44	3½ to 4	"	32	40	63	"
18 Budapesth.............	42 to 48	3 to 4	"	32	30	63	"
19 Pride of Illinois.	42 to 50	3 to 3½	Beardless...	30		62¼	Very slightly.
20 Early Red Clawson....	48 to 51	3½ to 4	" ...	29		60¼	Slightly.
21 Surprise...............	44 to 48	3 to 4	" ...	20	20	61	"
22 Siberian................	40 to 44	3 to 3½	" ...	19	40	61	Considerably.
23 American Bronze......	44 to 48	3½ to 4	" ...	19		60¾	Slightly.
24 Bulgarian..............	42 to 48	3 to 3½	Bearded....	16		60	"

EXPERIMENTS WITH SPRING WHEAT.

Experiments have been conducted during the past season with sixty-five varieties of spring wheat, all grown in plots of $\frac{1}{40}$th of an acre each. The soil was a sandy loam of medium quality, which received a dressing of barn-yard manure of about 12 tons to the acre during the winter of 1895-96. This was placed on the frozen land fresh from the barn-yard, in small heaps of about half a cart load each and spread and ploughed under in the spring. No manure or other fertilizer has been applied since. The previous crop was pease. The land was gang-ploughed shallow shortly after harvest in 1897 to start shed grain and weed seeds, and ploughed again late in the autumn about 8 inches deep. In the spring of 1898 it was disc-harrowed twice, and harrowed with the smoothing harrow twice before sowing. The seed was sown from the 20th to the 22nd of April at the rate of 1½ bushels per acre and the land was rolled before the grain came up.

Spring Wheat—Test of Varieties.

Name of Variety.	Date of Ripening.		Number of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.	In.		Bush.	Lbs.	Lbs.	
1 Laurel	Aug.	2	102	43—49	3½—4¾	Beardless...	32	30	61½	Slightly.
2 Plumper	July	29	100	36—40	3½—4	Bearded....	31	15	62	"
3 Rio Grande	Aug.	2	104	44—48	3½—4½	" ...	30	50	63	"
4 Emporium	"	2	104	46—48	4 —5	" ...	30	40	62	"
5 Wellman's Fife	"	4	106	44—46	4½—5	Beardless...	30		60	"
6 Blair	"	1	103	40—44	2½—3¼	" ...	29	30	62	"
7 Preston	July	29	100	40—43	3½—4¼	Bearded....	28	50	62	None.
8 Colorado	Aug.	1	101	41—46	3¼—4	" ...	28	20	62½	Slightly.
9 Goose	"	2	103	42—46	2½—3½	" ...	28	10	64½	"
10 Fraser	July	29	98	40—43	2½—3¾	" ...	28	10	60	Considerably.
11 Rideau	"	30	101	40—48	3 —3½	Beardless...	27	20	59	Slightly.
12 Beaudry	"	29	99	42—46	2½—3¼	Bearded....	27	20	63½	Very slightly.
13 Vernon	Aug.	1	101	38—46	3 —4	" ...	27	10	62	Slightly.
14 Red Fern	"	2	104	40—46	4½—5½	" ...	27	10	62½	"
15 Black Sea	"	1	102	41—44	3½—4	" ...	27	10	60	"
16 Stanley	"	1	102	40—45	3½—4¼	Beardless...	26	50	59¾	Very slightly.
17 Percy	July	29	99	44—48	3¼—4½	" ...	26	40	62	Slightly.
18 Campbell	"	29	98	39—41	3 —4	" ...	26	40	60	Considerably.
19 Dion's	Aug.	2	104	40—46	4½—5½	Bearded....	26	40	62½	Slightly.
20 Weldon	"	2	102	47—49	2½—3½	Beardless...	26	40	60	Considerably.
21 Crawford	"	1	103	40—43	3½—4	" ...	26	30	61	Slightly.
22 Ebert	July	29	100	34—38	3 —3½	" ...	26		62½	"
23 Pringle's Champlain	"	30	99	38—48	3½—4¼	Bearded....	26		60¼	"
24 Clyde	Aug.	2	102	43—45	3½—4½	Beardless...	25	40	60½	"
25 Countess	"	1	102	40—44	3 —3¾	" ...	25	30	61½	"
26 Byron	"	1	101	38—40	2½—3¼	Bearded....	25	20	60	Considerably.
27 Monarch	"	2	104	40—44	3½—4½	Beardless...	25	20	61	"
28 Benton	"	2	102	38—40	2½—3¼	" ...	25		60	Badly.
29 Cassel	"	6	106	40—46	3½—4	" ...	25		59½	"
30 Cartier	July	27	98	39—46	2½—3	Bearded....	24	45	63	Slightly.
31 Huron	Aug.	2	104	38—46	3½—4	" ...	24	10	62	"
32 Progress	"	1	102	40—44	3½—4	Beardless...	24		61	"
33 WhiteChaff Campbell's	"	1	101	40—43	3¼—4	" ...	23	40	60	"
34 Harold	July	26	95	38—46	3¼—4	Bearded....	23		57	Considerably.
35 Early Riga	"	26	95	38—12	3¼—4	Beardless...	23		59	"
36 Golden Drop	Aug.	2	103	40—44	2½—3¼	" ...	22	40	61	Slightly.
37 Captor	"	1	102	40—48	3½—4¼	" ...	22	22	60¼	"
38 Hungarian	"	2	104	36—40	2½—3½	Bearded....	22	20	63	"
39 Norval	"	2	102	42—44	3 —3½	" ...	22	4	61	Considerably.
40 Crown	"	2	104	34—38	3 —3¼	" ...	22		61	Slightly.
41 Gehum	July	27	98	36—39	2 —2½	" ...	22		60	"
42 Hastings	Aug.	2	102	38—40	2½—3½	Beardless...	22		61½	Considerably.
43 Roumanian	"	8	108	42—52	2¾—3½	Bearded....	22		63	Slightly.
44 Chester	"	1	101	37—39	3½—4¼	Beardless...	21	50	59	Considerably.
45 Herisson Bearded	"	5	106	30—38	2¼—3	Bearded....	21	40	64	Slightly.
46 White Fife	"	4	106	34—38	3 —4	Beardless...	21	30	60	"
47 White Connell	"	5	107	39—44	3 —3¾	" ...	21	30	60½	"
48 Red Fife	"	8	110	39—42	3¼—4	" ...	21	20	59¼	"
49 Allan	"	2	104	41—43	2½—3¾	" ...	21	10	61	"
50 Blenheim	"	5	107	40—43	2½—3¾	" ...	21		60½	"
51 Mason	"	1	103	40—44	3 —4	" ...	20	45	61½	Considerably.
52 Dawn	"	6	106	34—39	3¼—4	" ...	20		59	Slightly.
53 Advance	"	4	106	41—46	3¾—4¼	Bearded....	18	40	61	"
54 Dufferin	"	4	106	40—43	3 —3¾	" ...	17	15	60	Considerably.
55 Ladoga	"	1	103	38—44	3 —3½	" ...	17		60	Slightly.
56 Bishop	"	4	106	32—38	2½—3¼	Beardless...	16	40	62½	"
57 Alpha	"	5	107	38—48	3½—4½	" ...	16	30	60	"
58 Old Red River	"	4	106	40—44	3 —4	" ...	16	10	60¼	"
59 Essex	"	6	106	40—44	3 —4	" ...	16		57½	"
60 Admiral	"	3	103	30—38	3 —3¾	" ...	15	20	59	Considerably.
61 Beauty	"	5	107	42—48	4 —4¾	" ...	15	20	58	Slightly.
62 White Russian	"	4	104	40—44	3½—4½	" ...	15		61	"
63 Dawson	"	5	107	40—43	3¼—4	" ...	14	30	60½	"
64 Pride of Baropa	"	4	106	40—44	3 —3½	" ...	14	10	61	"
65 Angus	"	4	105	30—36	2½—3	" ...	14		60	Considerably.

In the foregoing list there are included forty-one of the new cross-bred sorts, which have been originated at the experimental farms. A list of the names and parentage of fifteen cross-bred sorts was given in the Annual Report for 1896, page twenty, and a second list of sixteen more in the Annual Report for 1897, page sixteen. This year thirty of the thirty-one contained in these two lists have been tried again and the following eleven new sorts added to the list:—

32.	Campbell—Gehun..........	Female with	Campbell's White Chaff	Male.
33.	Weldon—Red Fife..........	"	Hard Red Calcutta...	"
34.	Clyde—Hard Red Calcutta...	"	Red Fife............	"
35.	Byron—Campbell's White Chaft	"	Gehun..............	"
36.	Benton—Gehun	"	Campbell's White Chaft	"
37.	Cassel—Hard Red Calcutta...	"	Red Fife..........	"
38.	Early Riga—Gehun..........	"	Onega.............	"
39.	Norval—Delhi..............	"	Manchester, Fall Wheat	"
40.	Hastings—Colorado..........	"	Gehun..............	"
41.	Chester—Alpha.............	"	Gehun..............	"
42.	Allan—Colorado...........	"	Gehun..............	"

Of these results in cross fertilizing one was originated at the Central Experimental Farm by the Director, in 1891, No. 42. Six were the results of the work of Mr. W. T. Macoun, also at the Central Farm, one was produced in 1890, No. 39, and five were produced in 1891, Nos. 32, 35, 36, 38 and 40. Four were originated by Dr. A. P. Saunders in 1892, one, No. 33, at the branch experimental farm at Brandon, Manitoba, two at the branch farm at Indian Head, N.W.T., Nos. 34 and 37, and one at the branch farm at Agassiz, No 41.

Field Crops of Spring Wheat.

Preston.—2 acres. The soil in this plot was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was roots. The land was manured in the spring of 1893 with about 18 tons of barn-yard manure per acre; no fertilizer has been applied since. The land was ploughed in the spring of 1898, about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. Sown 18th April; 1½ bushels per acre; came up 30th April, and was ripe 26th July. The time to mature was 99 days. Yield per acre, 31 bushels 22 pounds; weight per bushel, 62 pounds. Length of head, 3½ to 3¾ inches; bearded; length of straw, 38 to 42 inches. Growth strong and even; all standing well. There was no smut, and no rust.

Stanley.—1 acre. Soil a heavy sandy loam of fairly good quality, slightly tending to clay, which received a dressing of about 15 tons of barn-yard manure per acre, in the spring of 1897. No fertilizer has been applied since. The previous crop was corn. The land was ploughed late in the autumn of 1897, about 8 inches deep and disc-harrowed twice the following spring, and harrowed twice with the smoothing harrow before sowing. Sown 16th April; 1½ bushels per acre; came up 27th April, and was ripe 26th July. The time to mature was 89 days. Yield per acre, 18 bushels 29 pounds; weight per bushel, 62½ pounds. Length of head, 2½ to 3¼ inches; beardless; length of straw, 36 to 40 inches. Growth medium and even; all standing well. There was no smut or rust.

Dion's.—1 acre. This and the next four plots referred to were all adjoining the Stanley; the soil was similar and the preparation and treatment of the land the same. Sown 16th April; 1½ bushels per acre; came up 27th April, and was ripe 26th July. The time to mature was 101 days. Yield per acre, 23 bushels 28 pounds; weight per bushel, 61¼ pounds. Length of head, 3½ to 4 inches; length of straw, 38 to 44 inches. Growth strong and even; all standing well. There was no smut and no rust.

Preston.—2 acres. Sown 16th April; 1½ bushels per acre; came up 28th April, and was ripe 26th July. The time to mature was 101 days. Yield per acre, 30 bushels 43 pounds; weight per bushel, 62 pounds. Length of head, 3½ to 3¾ inches; bearded; length of straw, 38 to 42 inches. Growth strong and even; all standing well. There was no smut, and no rust.

Wellman's Fife.—1 acre. Sown 16th April; 1½ bushels per acre; came up 27th April, and was ripe 29th July. The time to mature was 104 days. Yield per acre, 25 bushels 6 pounds; weight per bushel, 58 pounds. Length of head, 3½ to 4 inches; beardless; length of straw, 38 to 44 inches. Growth strong and even; all standing well. There was no smut, and no rust.

Monarch.—1 acre. Sown 16th April; 1½ bushels per acre; came up 27th April, and was ripe 29th July. The time to mature was 104 days. Yield per acre, 28 bushels 8 pounds; weight per bushel, 58½ pounds. Length of head, 3 to 3½ inches; beardless; length of straw, 36 to 41 inches. Growth strong and even; all standing well. There was no smut, and no rust.

Percy.—1 acre. Sown 16th April; 1½ bushels per acre; came up 28th April and was ripe 25th July. The time to mature was 100 days. Yield per acre, 25 bushels 37½ pounds; weight per bushel, 62 pounds. Length of head, 3 to 3½ inches; beardless; length of straw, 38 to 40 inches. Growth strong and even; all standing well. There was no smut, and no rust.

SPRING WHEATS FROM AUSTRALIA.

Nineteen varieties of spring wheat were received from Australia early in the year. These were all supposed to be freer from rust than other varieties and some of them were said to be rust proof. As they were received in very small quantities no satisfactory estimate could be made of the yield per acre. Probably this can be done another year. The varieties received from this source were all beardless. None of them were entirely free from rust here.

Variety.	Sown.	Ripe.	Rusted.	Remarks.
No. 1*b*, Tweed	April 27	August 13	Considerably	Not promising.
" 2	" 27	" 8	Slightly	Promising.
" 3*a*	" 27	" 16	Badly	Not promising.
" 5*a*	" 27	" 13	Slightly	Fairly promising.
" 5*c*	" 27	" 8	Considerably	Not promising.
" 6*a*	" 27	" 13	Badly	"
" 6*b*	" 27	" 15	"	"
" 7, Felbrig	" 27	" 15	"	"
" 8, Hazel	" 27	" 13	"	"
" 9	" 27	" 8	Slightly	Promising.
" 10*a*	" 27	" 13	Considerably	Not promising.
" 10*b*	" 27	" 9	Slightly	Fairly promising.
" 11*a*, Mainspring	" 27	" 15	Badly	Not promising
" 11*b* "	" 27	" 15	"	"
" 12*a*, Spring Sure	" 27	" 15	"	"
" 12*b* "	" 27	" 15	"	"
" 13, Duff	" 27	" 9	Slightly	Promising.
" 14	" 27	" 9	"	"
" 15*a*	" 27	" 16	Considerably	Not promising.

It is proposed to give these varieties further trial.

EXPERIMENTS WITH PEASE.

Sixty-six varieties of pease were included in the trial plots during the past year. The nine varieties named Harrison's Glory, Fenton, Alma, King, Kent, Canadian Beauty, Daniel O'Rourke, Trilby and Prince are not reported on for the following reason. On the 5th of August, when these were cut and drying in the field, a violent storm of wind suddenly arose which carried them all to the other end of the field and they were so mixed that it was impossible to separate them.

The pease were all sown in plots of $\frac{1}{40}$th of an acre each. The soil was a sandy loam of good quality which received a dressing of barn-yard manure about 12 tons per acre, during the winter of 1895-96. The manure was taken fresh from the barn-yard and placed on the frozen land in small piles of about half a cart load each to keep it from fermenting, and spread in the spring. The previous crop was barley. The land was gang-ploughed shallow, shortly after harvest to start shed grain and weed seeds, and ploughed later in the autumn about 8 inches deep. In the spring of 1898 it was disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. From 2 to 3 bushels per acre were sown, depending on the size of the peas and all were sown from the 18th to the 20th of April.

PEASE.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
1 Arthur	July 30	102	Strong	50—62	1¾—2¼	46	50	64
2 Elephant Blue	Aug. 2	105	"	49—66	2 —3¾	45	20	63½
3 Macoun	" 8	112	"	70—88	2½—3	40	..	63¼
4 Picton	" 2	105	"	41—53	1¾—2½	40	..	63½
5 Pride	July 29	101	"	30—40	2 —2½	40	..	62½
6 Prussian Blue	Aug. 2	106	"	50—78	2 —2¾	40	..	64
7 Chelsea	" 6	109	"	53—65	2 —2½	39	50	63
8 Perth	" 1	104	"	42—54	2 —2¾	39	30	63¼
9 Crown	July 29	101	Medium	46—58	2 —2½	39	10	65
10 Multiplier	Aug. 4	108	Strong	60—72	1¾—2½	38	40	63
11 Lanark	" 2	104	"	42—51	2 —2½	38	30	63
12 Pearl	" 6	109	"	47—59	2 —2¾	38	30	63½
13 Black-eyed Marrowfat	" 2	105	"	50—56	2¼—3	38	20	63½
14 Centennial	" 2	105	"	49—59	1½—2¼	38	..	64
15 Archer	" 4	108	"	50—66	2 —2¾	38	..	63¾
16 Large White Marrowfat	" 8	111	"	60—80	2½—3¼	37	30	63
17 Vincent	" 3	107	"	46—58	2½—3	37	20	62
18 Oddfellow	" 2	106	"	38—46	1½—2	36	40	66¾
19 Elder	" 4	108	"	44—46	1¾—2¼	36	..	63
20 German White	July 29	101	"	53—65	2 —2½	35	50	63½
21 Mackay	Aug. 4	107	"	60—64	2¼—2¾	35	40	62½
22 Elliott	" 8	111	"	51—63	2¼—2¾	35	40	63¾
23 Chancellor	July 28	100	Medium	56—68	1½—2	35	40	65
24 Dover	Aug. 5	108	Strong	50—62	2½—3	35	20	63¼
25 Herald	" 5	108	"	47—69	2 —2½	34	40	64
26 Kingsford	" 4	106	"	50—61	2 —2½	34	30	64
27 Tracey	" 4	107	"	43—55	2 —2¾	34	20	63¾
28 Bright	" 6	108	"	48—67	2 —2¾	34	10	64
29 Derby	" 6	110	"	50—62	2½—3¼	33	50	63
30 Bedford	" 6	109	"	50—60	2 —2¾	33	20	63¾
31 Nelson	" 2	104	"	40—52	1¾—2½	33	20	64
32 Mummy	" 1	104	"	44—66	1¾—2½	33	10	63
33 Nixon	" 4	108	"	66—84	2 —2½	32	40	63¾
34 Grant	" 8	112	"	60—82	2¼—3	32	40	63
35 Creeper	" 1	105	"	48—60	2 —2½	32	40	64
36 Kerry	" 6	109	"	41—53	2¼—3	32	10	63¼
37 Prospect	" 6	109	"	43—55	2 —2½	32	..	64
38 Paragon	" 4	107	"	46—58	1¾—2¼	31	20	63

PEASE—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
39 Dexter	Aug. 8	111	Strong	49—56	$2\frac{1}{4}$—3	31	20	63
40 New Potter	" 3	106	"	54—66	2 —$2\frac{3}{4}$	31	10	62
41 Fergus	" 5	107	"	56—58	2 —$2\frac{3}{4}$	30	50	64
42 Carleton	" 2	106	"	50—58	2 —$2\frac{3}{4}$	30	40	$64\frac{3}{4}$
43 Hazen	" 2	105	"	56—62	2 —3	30	40	64
44 Forbes	" 5	108	"	52—64	$1\frac{3}{4}$—$2\frac{1}{4}$	30	40	63
45 Cooper	" 6	108	"	38—46	$1\frac{3}{4}$—$2\frac{1}{4}$	30	30	64
46 Duke	" 2	105	"	50—58	2 —$2\frac{3}{4}$	30	20	64
47 Prince Albert	" 8	112	"	60—82	$1\frac{3}{4}$—$2\frac{1}{2}$	30	20	64
48 Bruce	" 6	108	"	42—54	2 —$2\frac{3}{4}$	30	..	$63\frac{1}{4}$
49 Victoria	" 6	109	"	38—50	2 —$2\frac{1}{2}$	30	..	$63\frac{3}{4}$
50 Agnes	" 1	104	"	48—60	2 —$2\frac{1}{2}$	29	40	$64\frac{1}{4}$
51 Gregory	" 5	107	"	45—57	2 —$2\frac{1}{2}$	29	20	63
52 Dixon	" 2	106	"	50—78	2 —$2\frac{3}{4}$	29	20	62
53 Clarke	" 9	112	"	49—56	2 —$2\frac{1}{2}$	29	20	64
54 Moore	" 1	105	"	36—50	$2\frac{1}{4}$—3	28	50	63
55 Early Britain	July 26	99	"	40—50	2 —$2\frac{1}{2}$	27	50	$63\frac{1}{4}$
56 French Canner	" 29	102	Weak	41—48	$1\frac{3}{4}$—$2\frac{1}{4}$	21	20	62
57 White Wonder	" 27	100	"	20—22	$1\frac{1}{2}$—$2\frac{1}{2}$	20	..	63

FIELD CROPS OF PEASE.

New Potter.—One-half acre. Soil partly clay loam, and part peaty, which received a dressing of barn-yard manure of about 12 tons per acre in the spring of 1896, and has had no fertilizer since. The previous crop was oats. The land was ploughed in the spring of 1898 about 6 inches deep, turning under a good mat of clover which had been sown with the oats in 1897. The land was then disc-harrowed once and harrowed twice with the smoothing harrow before sowing. Sown 9th April; $2\frac{1}{2}$ bushels per acre; came up 9th May, and was ripe 8th August. The time to mature was 103 days. Yield per acre, 25 bushels; weight per bushel, 62 pounds. Growth medium and even; pods medium. Length of straw, 50 to 60 inches.

Canadian Beauty.—One-half acre. This and the three following plots were adjoining that of New Potter; the soil was similar and the preparation and treatment of the land the same throughout. Sown 27th April; 3 bushels per acre; came up 10th May, and was ripe 10th August. The time to mature was 105 days. Yield per acre, 29 bushels 30 pounds; weight per bushel, 64 pounds. Growth strong and even; pods large. Length of straw, 55 to 60 inches.

White Marrowfat.—One-half acre. Sown 27th April; 3 bushels per acre; came up 10th May; and was ripe 10th August. The time to mature was 105 days. Yield per acre, 28 bushels 6 pounds; weight per bushel, 63 pounds. Growth strong and even; pods large. Length of straw, 55 to 62 inches.

Creeper.—One-half acre. Sown 27th April; $2\frac{1}{2}$ bushels per acre; came up 9th May, and was ripe 8th August. The time to mature was 103 days. Yield per acre, 34 bushels 54 pounds; weight per bushel, $64\frac{1}{4}$ pounds. Growth strong and even; pods small. Length of straw, 46 to 54 inches.

Prussian Blue.—One-half acre. Sown 27th April; $2\frac{1}{2}$ bushels per acre; came up 9th May, and was ripe 6th August. The time to mature was 101 days. Yield per acre, 35 bushels 36 pounds; weight per bushel, $64\frac{1}{2}$ pounds. Growth strong and even; pods medium to small. Length of straw, 45 to 55 inches.

Common Field Peas,—5 acres. Soil sandy loam of medium quality, part of this land received in the spring of 1894 an application of about 12 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop on part of this land was corn and potatoes, the other part had been used as a nursery for young forest trees and had not received any manure or other fertilizer. The land was ploughed in the spring of 1898, about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. Sown 3rd May; $2\frac{1}{2}$ bushels per acre; came up 14th May, and was ripe 9th August. The time to mature was 99 days.

Yield per acre, 32 bushels 7 pounds. Growth medium and even; pods small. Length of straw, 40 to 52 inches.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

These tests were all conducted on similar land, on $\frac{1}{10}$th acre plots, the plots adjoining each other. The soil was a sandy loam of fair quality which received a dressing of barn-yard manure, about 12 tons per acre, in the autumn of 1895 when it was ploughed under. The land also received an application of unleached wood ashes in November, 1897, of about 125 bushels per acre. No fertilizers have been applied since. The previous crop was grain in experimental plots, the different kinds of grain being sown in rotation. The land was ploughed in the autumn, about 8 inches deep, and in the spring a sufficient quantity of the land for the first set of plots was gang-ploughed and harrowed twice with the smoothing harrow before sowing, the first sowing being made as soon as the land was in condition to receive the seed. The oats were sown at the rate of $2\frac{1}{4}$ bushels per acre, the Canadian Thorpe barley, 2 bushels, the Odessa $1\frac{3}{4}$, the spring wheat $1\frac{1}{2}$ bushels, the Mummy pease, $2\frac{3}{4}$ bushels and the Golden Vine, $2\frac{1}{2}$ bushels per acre. A sufficient portion of the land set aside for the subsequent sowings was worked up from week to week in the manner described, as it was needed, and in this way any weeds which had started were killed and each series of plots were given the same chance at the start as far as condition of soil was concerned.

OATS SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Weight of Straw. per Acre.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.	Lbs.	Bush.	Lbs.	Lbs.	
Banner.........	April 11	July 25	105	36 to 42	2,310	44	4	34	None
"	" 18	" 28	101	42 to 48	3,270	57	32	$33\frac{3}{4}$	Slightly.
"	" 25	" 29	95	32 to 40	3,390	53	8	$35\frac{1}{2}$	"
"	May 2	August 5	95	32 to 40	3,440	54	14	$34\frac{1}{2}$	Considerably.
"	" 9	" 9	92	30 to 38	3,390	43	8	35	Slightly.
"	" 16	" 12	88	32 to 42	2,730	40	30	$34\frac{1}{4}$	Badly.
Abundance.......	April 11	July 23	103	36 to 40	2,330	48	8	$35\frac{1}{4}$	None
"	" 18	" 27	100	42 to 48	3,750	63	8	$33\frac{1}{4}$	Slightly.
"	" 25	" 29	95	34 to 40	3,870	54	24	$34\frac{1}{4}$	"
"	May 2	August 4	94	32 to 40	3,210	46	26	35	"
"	" 9	" 8	91	30 to 38	3,070	46	6	35	Badly.
"	" 16	" 10	86	32 to 40	3,320	47	12	$31\frac{1}{2}$	"

BARLEY SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.	Lbs.	Bush.	Lbs.	Lbs.	
Canadian Thorpe.	April 11	July 21	101	36 to 40	2,440	38	36	51	None.
" " .	" 18	" 25	98	38 to 46	4,660	48	36	51	"
" " .	" 25	" 27	93	36 to 42	3,530	39	38	47	"
" " .	May 2	August 1	91	36 to 42	2,580	41	12	50$\frac{3}{4}$	Badly.
" " .	" 9	" 6	89	32 to 40	3,060	25	40	48$\frac{3}{4}$	"
" " .	" 16	" 10	86	36 to 40	3,380	25	20	48$\frac{1}{4}$	"
Odessa	April 11	July 16	96	36 to 38	2,550	46	2	50	None.
"	" 18	" 18	91	36 to 40	3,570	59	8	50	"
"	" 25	" 20	86	36 to 38	3,470	54	38	49$\frac{3}{4}$	"
"	May 2	" 25	84	36 to 38	3,910	55	10	46$\frac{3}{4}$	"
"	" 9	" 28	80	35 to 38	3,430	31	22	47$\frac{3}{4}$	Badly.
"	" 16	August 1	77	35 to 38	3,050	28	36	46	"

SPRING WHEAT SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Rusted.
Red Fife......	April 11	August 4	115	36 to 42	1,980	13	50	59	Slightly.
"	" 18	" 8	112	44 to 48	3,060	29	10	59$\frac{1}{2}$	"
"	" 25	" 9	106	30 to 34	2,140	12	50	57$\frac{1}{2}$	Considerably.
"	May 2	" 13	103	20 to 24	2,350	10	50	57	Badly.
"	" 9	" 13	96	30 to 34	2,950	7	10	52	"
"	" 16	" 14	90	30 to 32	2,840	6	50	53	"
Stanley	April 11	July 27	107	32 to 38	2,830	14	30	60$\frac{1}{2}$	Slightly.
"	" 18	" 30	103	42 to 48	2,470	27	10	61$\frac{3}{4}$	"
"	" 25	August 6	103	30 to 34	2,420	12	20	58$\frac{1}{4}$	Considerably.
"	May 2	" 9	99	30 to 32	2,530	10	10	58	Slightly.
"	" 9	" 10	93	30 to 32	3,150	7	30	55$\frac{1}{2}$	Badly.
"	" 16	" 13	89	30 to 32	3,050	6	10	55	"

PEASE SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Rusted.
Mummy...........	April 11	July 27	107	48 to 52	2,130	26	30	64	
"	" 18	" 29	102	48 to 56	2,890	37	40	65	
"	" 25	August 5	102	46 to 56	3,150	29	30	63$\frac{1}{2}$	
"	May 2	" 9	99	46 to 54	2,380	30	30	63$\frac{3}{4}$	
"	" 9	" 10	93	46 to 54	3,110	25	40	64$\frac{1}{2}$	
"	" 16	" 13	89	46 to 54	2,650	25	10	60$\frac{3}{4}$	
Golden Vine......	April 11	July 23	108	50 to 58	2,680	32	50	63$\frac{1}{2}$	
"	" 18	" 28	101	50 to 60	3,310	34	10	64	
"	" 25	August 8	105	50 to 60	2,640	30	50	63$\frac{3}{4}$	
"	May 2	" 10	100	50 to 58	2,490	37	10	64	
"	" 9	" 10	93	48 to 58	3,750	30	10	62$\frac{1}{4}$	
"	" 16	" 13	89	48 to 60	2,970	27	40	57$\frac{1}{4}$	

SUMMARY OF RESULTS OF EARLY, MEDIUM AND LATE SOWINGS FOR THE WHOLE PERIOD.

The following are the average crops which have been obtained during the full period these tests have been continued, that is, nine years with the oats, barley and spring wheat and four years with the pease :—

Tests continued for Nine Years.									Tests continued for Four Years.		
Oats.	Average Yield per Acre.		Barley.	Average Yield per Acre.		Spring Wheat.	Average Yield per Acre.		Pease.	Average Yield per Acre.	
	Bush.	Lbs.		Bush.	Lbs.		Bush.	Lbs.		Bush.	Lbs.
1st Sowing ..	53	32	1st Sowing ..	40	8	1st Sowing ..	17	59	1st Sowing ...	29	26
2nd " ..	59	13	2nd " ..	42	47	2nd "	20	21	2nd " ...	33	30
3rd " ..	50	17	3rd " ..	34	11	3rd " ..	14	7	3rd " ...	32	36
4th " ..	45	3	4th " ..	31	15	4th " ..	12	15	4th " ...	30	23
5th " ..	40	3	5th " ..	25	22	5th " ..	10	12	5th " ...	26	42
6th " ..	31	3	6th " ..	23	8	6th " ..	8	40	6th " ...	24	41

EXPERIMENTS WITH INDIAN CORN.

During the season of 1898 twenty-six varieties of Indian corn were tested side by side on fairly uniform land. The soil was a sandy loam of fair quality, and the previous crop was hay. The land was ploughed very shallow immediately after the hay crop was taken off, and cultivated at short intervals to keep all growth down until autumn. A dressing of barn-yard manure fresh of about 12 tons per acre was distributed over this land in small piles of about one-third of a cart load each during the winter, and spread in the spring, after which it was ploughed under about six inches deep and harrowed with the smoothing harrow before planting. The varieties were all planted on the 18th of May, and were cut for ensilage on the 17th of September. The yield per acre has been calculated from the weight of the crop cut from two rows each 66 feet long.

Indian Corn—Test of Varieties.

Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		Inches.		25th Sept.	Tons.	Lbs.	Tons.	Lbs.
Red Cob Ensilage...........	Very strong.	108 to 120	Leafy	Early milk..	24	1,170	25	820
Early Mastodon.............	" ..	120 to 132	"	Late milk ..	24	1,060	24	400
Cloud's Early Yellow.........	Strong	96 to 120	"	Glazed	24	473	19	1,160
Giant Prolific Ensilage.......	Very strong.	96 to 120	"	Early milk..	22	1,100	24	1,720
Country Gentleman	Strong	72 to 84	"	Doughy	22	550	21	1,670
Early Butler..............	"	96 to 108	"	" .. .	21	1,340	22	660
Evergreen Sugar............	"	90 to 102	"	Watery.....	21	900	20	1,360
Thoroughbred White Flint....	Very strong.	96 to 120	Very leafy	Late milk ..	20	1,800	21	900
Champion White Pearl......	Strong	96 to 108	Fairly leafy...	" ..	20	247	20	1,490
Sanford.......	"	84 to 108	Leafy	Glazed	20	113	19	1,490
Selected Leaming	"	108 to 120	"	"	19	1,380	18	300
Pride of the North	"	96 to 108	Very leafy	"	19	940	13	1,903
White Cap Yellow Dent......	"	102 to 108	Leafy	Late milk ..	19	170	19	1,600
Extra Early Huron..........	"	96 to 108	"	Glazed	18	1,180	16	1,110
Mammoth Cuban............	"	96 to 120	Very leafy	"	18	80	20	700
King of the Earliest.........	"	96 to 108	Leafy	"	17	1,200	17	833
Ruby Mexican.............	"	84 to 96	"	Doughy	17	100	18	1,510
Mammoth Eight-rowed Flint..	"	84 to 96	"	Glazed	16	1,440	21	1,230
Canada White Flint....	"	84 to 96	"	"	16	340	17	1,860
North Dakota White........	"	96 to 120	"	"	15	1,240	19	1,380
Smut Nose Flint............	Medium....	84 to 90	Fairly leafy...	"	15	800	16	340
Longfellow............. ..	Strong	84 to 96	Leafy	"	14	1,920	17	1,420
Pearce's Prolific............	Medium....	84 to 90	Fairly leafy...	"	14	1,113	20	1,360
Angel of Midnight	Strong	84 to 96	Leafy	"	14	1,060	18	1,300
Compton's Early............	"	84 to 96	"	"	13	180	15	800
Mitchell's Extra Early.......	Medium....	60 to 66	Fairly leafy...	Ripe	11	660	9	480

Field Crops of Indian Corn.

The following eighteen varieties were planted in ½ acre plots, all adjoining each other on similar soil and with the same treatment. The soil was a sandy loam of fair quality, and the previous crop was hay. The land was ploughed very shallow immediately after the hay crop was taken off in 1897, and cultivated at short intervals to keep all growth down until autumn. An application of fresh barn-yard manure of about 12 tons per acre was distributed in small piles of about one-third of a cart load each to prevent it from fermenting during the winter, and spread in the spring, after which it was ploughed under about 6 inches deep and harrowed with the smoothing harrow, and marked with a wide marker before planting.

1. *Rural Thoroughbred White Flint.*—½ acre. Planted 17th May, in hills 3 feet apart each way, 4 to 5 kernels in each hill; came up 30th May, and was cut for ensilage 8th September. The growth was strong and even, leafy from top to bottom, and 8 to 9 feet high; the stalks well eared; ears in the early milk stage. Yield per acre, 17 tons 526 pounds.

2. *Mammoth Eight-rowed Flint.*—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 3rd September. Growth strong and even, leafy from top to bottom, 7 to 8 feet high; stalks extra well eared, and the ears well advanced in the glazed condition, some of them beginning to harden. Yield 18 tons 500 pounds per acre.

3. *Compton's Early.*—½ acre. Planted 17th May in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 3rd September. Growth strong and even; leafy from top to bottom; height, 7 to 8 feet; stalks well eared; ears well advanced in the glazed condition, some of them beginning to harden. Yield 17 tons 40 pounds per acre.

4. *King of the Earliest.*—½ acre. Planted 17th May in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth strong and even; leafy on top, fairly leafy at bottom; height, 8 to 9 feet; stalks well eared: ears well advanced in the glazed condition, some of them beginning to harden. Yield 18 tons 660 pounds per acre.

5. *Extra Early Huron.*—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth strong and even; leafy at top and fairly leafy below; height, 8 to 9 feet; stalks well eared; ears well advanced in the glazed condition, some of them beginning to harden. Yield 13 tons 1,420 pounds per acre.

6. *Cloud's Early Yellow.*—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth strong and even; leafy at top, fewer leaves at bottom; height, 8 to 10 feet; stalks well eared; ears well advanced in the glazed condition, some of them beginning to harden. Yield 19 tons 1,820 pounds per acre.

7. *Red Cob Ensilage.*—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth very strong and even; leafy at top with very few leaves at bottom; height, 10 to 11 feet; ears not plentiful, some beginning to form. This variety was too late in ripening to make ensilage of best quality. Yield 23 tons 160 pounds per acre.

8. *Giant Prolific Ensilage.*—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth very strong and even; leafy above, with very few leaves below; height, 10 to 12 feet; stalks fairly well eared; ears in the early milk state. Yield 22 tons 1,840 pounds per acre.

9. *Champion White Pearl.*—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth very strong and even; leafy above, fairly leafy below; height, 9 to 11 feet; stalks well eared; ears in late milk state. Yield 20 tons 1,490 pounds per acre.

Early Mastodon.—½ acre. Planted 17th May, in hills 3 feet apart each way; came up 29th May, and was cut for ensilage 6th September. Growth very strong and even; leafy throughout; height 10 to 12 feet; stalks well eared; ears in early milk. Yield per acre 23 tons 570 pounds per acre.

11. *Canada White Flint.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May, aad was cut for ensilage 8th September. Growth strong and even; leafy from top to bottom; height 7 to 8 feet; stalks very well eared; ears beginning to ripen. Yield 13 tons 970 pounds per acre.

12. *Pride of the North.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May, and was cut for ensilage 9th September. Growth strong and even; leafy on top, fairly leafy at bottom; height 8 to 9 feet; stalks well eared; ears beginning to ripen. Yield 16 tons 1,730 pounds per acre.

13. *Early Butler.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May and was cut for ensilage 9th September. Growth strong and even; leafy at top, fewer leaves at bottom; height 8 to 9 feet; stalks well eared; ears beginning to ripen. Yield 16 tons 1,080 pounds per acre.

14. *North Dakota.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May, and was cut for ensilage 19th September. Growth strong and even; leafy throughout; height 8 to 9 feet; stalks well eared; ears almost ripe. Yield 15 tons 770 pounds per acre.

15. *Sanford.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May and was cut for ensilage 19th September; growth strong and even; leafy throughout; height 7 to 9 feet; stalks well eared; ears in the glazed condition, some of them beginning to ripen. Yield 14 tons 440 pounds per acre.

16. *Mammoth Cuban.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May, and was cut for ensilage 19th September. Growth very strong and even; leafy above; very few leaves below; stalks well eared; ears in late milk: height, 9 to 11 feet. Yield 17 tons 790 pounds per acre.

17. *Selected Leaming.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May, and was cut for ensilage 19th September. Growth very strong and even; leafy at top; very few leaves at bottom; height, 10 to 11 feet; stalks well eared, ears beginning to ripen. Yield 19 tons 254 pounds per acre.

18. *White Cap Yellow Dent.*—½ acre. Planted 19th May, in hills 3 feet apart each way; came up 30th May, and was cut for ensilage 8th September. Growth very strong and even; leafy on top; fairly leafy at bottom; height 10 to 12 feet; stalks well eared; ears in late milk, some of them beginning to ripen. Yield 19 tons 1,010 pounds per acre.

Indian Corn Sown in Rows at Different Distances.

Three varieties of Indian corn were selected for this test. The rows most closely planted were 7 inches apart—the width of the seed-drill—and the other distances were 14, 21, 28, 35, 42 and 49 inches respectively. The object was to gain information as to weight and crop when grown under these different conditions, also the number of cobs or ears, produced both large and small. The soil was a light sandy loam of fair quality. The previous crop was hay. The land was ploughed in the summer of 1897 very shallow, immediately after the hay crop was harvested, and disc-harrowed, and subsequently cultivated at intervals to keep down all growth. During the winter this land received a dressing of about 12 tons of fresh barn-yard manure per acre which was placed on the frozen ground in small piles to prevent fermentation, of about a third of a cart load each. This was spread in the spring, ploughed under about six inches deep and harrowed with the smoothing harrow before sowing. The plots were all sown with the seed drill on 17th May, closing the spouts not required as the distance between the rows was increased, and they were cut for ensilage on the 12th of September. When harvesting the yields per acre have been estimated from rows cut from the middle of each plot.

CORN—TEST OF THREE VARIETIES WITH ROWS PLANTED AT DIFFERENT DISTANCES.

Name of Variety.	Width of Row.	Character of Growth.	Description of Variety.	Height.	No. of Cobs and Nubbins.	Condition when Cut.	Weight per Acre grown in rows.	
				Inches.	Per acre		Tons.	Lbs.
Longfellow..	7 in. apart	Strong, partly lodged.	Yellow Flint.	62- 72	None.	No cobs or nubbins.	25	1501
"	14 " .	" ..	" ..	72- 84	9,360	Few cobs, beginning to ripen.	24	132
"	21 " .	" ..	" ..	72- 84	17,160	Fairly well cobbed, beginning to ripen.	28	194
"	28 " .	Standing fairly well.	" ..	84- 90	15,698	" ..	25	1762
"	35 " .	Standing well.	" ..	84- 96	19,460	Well cobbed....	27	82
"	42 " .	" ..	" ..	84- 96	20,365	"	25	725
"	49 " .	" ..	" ..	84- 96	19,401	"	24	1297
Selected Leaming.....	7 " .	Cons. lodged..	Red & yellow Dent.	64- 74	None.	No cobs....	24	85
"	14 " .	Standing fairly well.	" ..	72- 84	591	Very few cobs..	24	1782
"	21 " .	Strong, standing fairly well	" ..	84- 96	11,691	Late milk.	26	1177
"	28 " .	"	" ..	96-108	14,425	Beg. to ripen....	30	248
"	35 " .	Standing well.	" ..	96-108	19,686	"	24	1782
"	42 " .	" ..	" ..	96-120	18,480	"	24	1592
"	49 " .	" ..	" .	96-120	25,376	"	28	490
Champion White Pearl.	7 " .	Badly lodged .	Wh. Dent	120-125	None.	No cobs	29	268
" ..	14 " .	Beginning to lodge.	" ..	120-132	18,668	Fairly well cobbed.	27	308
" ..	21 " .	Standing well.	" ..	124-130	13,388	" ..	22	503
" ..	28 " .	" ..	" ..	124-136	13,294	" ..	27	1864
" ..	35 " .	" ..	" ..	124-136	12,672	" ..	29	42
" ..	42 " .	" ..	" ..	120-132	17,725	Well cobbed....	26	1554
" ..	49 " .	" ..	" ..	120-132	12,203	"	20	247

EXPERIMENTS WITH TURNIPS.

There were tested during the past season twenty varieties of turnips, all sown side by side on similar soil. The soil was a sandy loam of good quality, which was manured in the autumn of 1895 with about 12 tons of barn-yard manure per acre. The previous crop was oats. The land was ploughed early in the autumn of 1897 about 8 inches deep, and again in the spring of 1898, and harrowed twice with the smoothing harrow. The land was then made up in drills two feet apart and subsequently rolled with a heavy land roller which flattened the drills nearly one-half, leaving a firm seed bed. The seed was sown at the rate of 3 pounds per acre, and immediately after sowing there was applied on the drills, at the rate of 500 pounds per acre, a mixture composed of the following fertilizers : Odourless phosphate, 1,200 pounds ; kainite, 600 pounds ; superphosphate No. 2, 400 pounds, and nitrate of soda, 300 pounds. Four sowings were made of each variety, the first on 28rd April, second on 6th May, third on 21st May, and the fourth on the 11th of June, and all were pulled on the 13th of October. The yield per acre has been calculated from the weight of roots pulled from two rows each 66 feet long.

These turnips were sown in rows of 200 feet or more in length, which gave opportunity for further experiments after the two rows of 66 feet each, used to ascertain the yield in the first place, had been pulled. A portion of the roots in this area was left in the ground until later. to gain information as to what advantage, if any, results from

leaving turnips in the ground after the middle of October. Nineteen plots were so left until the 3rd of November, which allowed 21 days for additional growth, with the following results :—

TURNIPS—TEST OF VARIETIES.

No.	Name of Variety.	Yield per acre, 1st Plot.		Yield per acre, 1st Plot.		Yield per acre, 2nd Plot.		Yield per acre, 2nd Plot.		Yield per acre, 3rd Plot.		Yield per acre, 3rd Plot.		Yield per acre, 4th Plot.		Yield per acre, 4th Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant King..................	29	740	979		24	1,500	825		21	1,570	726	10	25	1,593	859	53
2	Purple Top Swede	29	740	979		29	1,565	992	45	28	1,040	950	40	21	240	704	
3	Jumbo	27	1,275	921	15	26	1,790	896	30	22	375	739	35	28	870	947	50
4	Mammoth Clyde......... .	27	1,275	921	15	26	470	874	30	22	1,045	750	45	23	200	770	
5	Drummond's Swede.........	27	1,110	918	30	27	120	902		25	160	836		19	1,160	619	20
6	Marquis of Lorne...........	27	780	913		26	1,130	885	30	20	1,250	687	30	21	1,890	731	30
7	Shamrock Purple Top........	26	1,625	893	45	26	1,295	888	15	23	1,685	794	45	24	1,940	832	20
8	Bangholm Selected..........	26	800	880		24	1,995	833	15	24	15	815		21	130	702	10
9	Skirving's Improved	26	470	874	30	27	615	910	15	24	1,665	827	45	27	1,220	920	20
10	Halewood's Bronze Top.....	25	1,645	860	45	27	615	910	15	21	1,935	732	15	28	1,090	951	30
11	Prize Purple Top	25	820	847		21	1,735	728	55	20	920	682		22	440	740	40
12	Perfection Swede	25	820	847		29	410	973	30	23	860	781		25	1,260	854	20
13	Prize Winner................	25	490	841	30	26	305	871	45	24	1,665	827	45	27	120	902	
14	Hall's Westbury............	25	325	838	45	23	860	781		27	285	904	45	21	350	705	50
15	Hartley's Bronze............	24	1,335	822	15	25	655	844	15	21	1,560	726		27	1,000	916	40
16	Sutton's Champion..........	24	840	814		26	1,625	893	45	23	1,850	797	30	26	1,460	891	
17	Selected Champion..........	23	200	770		23	1,850	797	30	22	1,870	764	30	27	1,990	933	10
18	Carter's Elephant...........	22	880	748		26	1,955	899	15	17	485	474	45	22	1,540	759	
19	East Lothian................	22	385	739	45	30	1,710	1028	30	23	35	767	15	26	360	872	40
20	Empress	....		....		....		....		....		....		....		....	
	Average of all sowings..	25	1,818	....		26	905	....		23	330	....		24	1,413	....	

YIELD OF ROOTS PER ACRE FROM EARLY AND LATE PULLING.

No.	Name of Variety.	1st pulling, 13th October, from 1st sowing, 28th April.		2nd pulling, 3rd Novem'r, from 1st sowing, 28th April.		1st pulling, 13th October, from 2nd sowing, 6th May.		2nd pulling, 3rd Novem'r, from 2nd sowing, 6th May.		1st pulling, 13th October, from 3rd sowing, 21st May.		2nd pulling, 3rd Novem'r, from 3rd sowing, 21st May.		1st pulling, 13th October, from 4th sowing, 11th June.		2nd pulling, 3rd Novem'r, from 4th sowing, 11th June.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Giant King..................	29	740	33	1,320	24	1,500	24	1,335	21	1,570	26	965	25	1,593	25	1,315
2	Purple Top Swede...........	29	740	33	577	29	1,565	31	40	28	1,040	32	350	21	240	27	1,605
3	Jumbo	27	1,275	34	310	26	1,790	24	1,335	22	375	27	697	28	870	28	1,750
4	Mammoth Clyde.............	27	1,275	33	1,815	26	470	23	695	22	1,045	21	1,313	28	200	25	490
5	Drummond's Swede........	27	1,110	32	1,587	27	120	25	1,480	25	160	26	1,212	19	1,160	29	575
6	Marquis of Lorne......... .	27	780	28	1,173	26	1,130	22	385	20	1,250	21	570	21	1,890	21	1,560
7	Shamrock Purple Top.......	26	1,625	27	1,192	26	1,295	25	1,150	23	1,685	27	1,687	24	1,940	27	1,605
8	Bangholm Selected.........	26	800	31	1,608	24	1,995	24	1,830	24	15	22	798	21	130	25	1,315
9	Skirving's	26	470	29	1,400	27	615	29	1,730	24	1,665	27	1,935	27	1,220	28	1,585
10	Halewood's Bronze Top....	25	1,645	33	82	27	615	24	1,995	21	1,935	29	905	28	1,090	29	1,235
11	Prize Purple Top	25	820	30	143	21	1,735	26	305	20	920	23	1,520	22	440	20	590
12	Perfection Swede...........	25	820	28	1,420	29	410	27	780	23	860	31	1,855	25	1,260	36	600
13	Prize Winner	25	490	28	1,172	26	305	29	575	24	1,665	27	1,440	27	120	27	1,440
14	Hall's Westbury............	25	325	30	1,380	23	860	25	820	27	285	25	490	21	350	25	1,315
15	Hartley's Bronze............	24	1,335	29	1,895	25	655	27	1,605	21	1,560	25	490	27	1,000	24	345
16	Sutton's Champion..........	24	840	30	1,380	26	1,625	24	1,005	23	1,850	25	1,727	26	1,460	26	1,295
17	Selected Champion..........	23	200	25	985	23	1,850	27	1,615	22	1,870	29	905	27	1,990	27	1,275
18	Carter's Elephant...........	22	880	23	1,768	26	1,955	27	1,110	17	485	23	530	22	1,540	22	385
19	East Lothian................	22	385	26	1,707	30	1,710	27	1,275	23	35	24	757	26	360	25	160

These figures show the following results :—

		Tons.	Lbs.
Average yield per acre from	1st sowing, 1st pulling. .	25	1,818
" "	1st sowing, 2nd pulling.	30	364

An average gain in 21 days of 4 tons 546 pounds per acre.

		Tons.	Lbs.
Average yield per acre from	2nd sowing, 1st pulling.	26	905
" "	2nd sowing, 2nd pulling.	26	687

An average loss in 21 days of 218 pounds per acre.

		Tons.	Lbs.
Average yield per acre from	3rd sowing, 1st pulling.	23	330
" "	3rd sowing, 2nd pulling.	26	639

An average gain in 21 days of 3 tons 309 pounds per acre.

		Tons.	Lbs.
Average yield per acre from	4th sowing, 1st pulling.	24	1,413
" "	4th sowing, 2nd pulling.	26	1,226

An average gain in 21 days of 1 ton 1,813 pounds per acre.

The results of these experiments although somewhat variable, and not so striking as those of last year, point to the same conclusion—which is, that growth in turnips as a rule proceeds rapidly late in the season as long as the weather remains open.

EXPERIMENTS WITH MANGELS.

Nineteen varieties of mangels were under test during 1898. These were all sown side by side adjoining the turnips. The land was similar but rather lighter, and the treatment and preparation was the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Three sowings were made, the first on the 28th of April, the second on the 6th of May, and the third on the 21st of May, and after sowing, the same mixture of fertilizers as was used on the turnips was applied on the drills of mangels in the proportion of 500 pounds per acre. The roots were all pulled on the 13th of October, and the yield per acre has been calculated from the weight of roots obtained from two rows each 66 feet long.

MANGELS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.		Yield per Acre from 2nd Sowing.		Yield per Acre from 3rd Sowing.		Yield per Acre from 3rd Sowing.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1 Gate Post	33	1,485	1,124	45	26	800	880		16	1,330	555	30
2 Giant Yellow Globe	33		1,118	20	24	345	805	45	22	220	737	
3 Golden Tankard	32	1,505	1,091	45	20	95	668	15	13	1,390	456	30
4 Yellow Intermediate	31	1,525	1,058	45	24	1,500	825		20	425	673	45
5 Giant Yellow Half-long	30	1,215	1,020	15	23	1,520	792		22	715	745	15
6 Mammoth Yellow Intermediate	30	390	1,006	30	26	305	871	45	18	1,455	624	15
7 Canadian Giant	28	595	943	15	20	95	668	15	16	1,660	561	
8 Mammoth Long Red	27	1,770	929	30	23	1,355	789	15	16	670	544	30
9 Prize Mammoth Long Red	27	615	910	15	23	1,685	794	45	15	1,020	517	
10 Giant Yellow Intermediate	26	1,130	885	30	23	860	781		17	1,145	585	45
11 Norbiton Giant	26	965	882	45	25	1,150	852	30	18	960	616	
12 Golden Fleshed Tankard	24	1,665	827	45	16	1,165	552	45	13	730	445	30
13 Champion Yellow Globe	24	345	805	45	21	735	712	15	14	1,205	486	45
14 Ward's Large Oval-shaped	23	1,850	797	30	18	300	605		19	280	638	
15 Warden Orange Globe	23	860	781		19	1,600	660		15	690	511	30
16 Selected Mammoth Long Red	23	860	781		20	260	671		16	1,990	566	30
17 Red Fleshed Globe	20	1,415	690	15	14	1,040	484		18	1,620	627	
18 Gate Post Yellow	16	835	547	15	20	590	676	30	15	855	514	15
19 Red Fleshed Tankard	16	10	533	30	16	670	544	30	12	1,740	429	
Average of all sowings	26	792	......	...	21	1162	....		17	216	....	

These results point to the importance of the early sowing of mangels.

The mangels in these tests were sown in rows 200 feet or more in length, which gave opportunity for further experiment, after the two rows of 66 feet each, used to determine the yield, had been pulled. A portion of the roots in this area was left in the ground until later, to gain information as to what advantage, if any, results from leaving mangels in the ground after the middle of October. Nineteen plots were so left until the 3rd of November, which allowed 21 days for additional growth, with the following results :—

MANGELS—YIELD PER ACRE FROM EARLY AND LATE PULLING.

Name of Variety.	1st pulling, 13th October, from 1st sowing, 28th April.		2nd pulling, 3rd Novem'r, from 1st sowing, 28th April.		1st pulling, 13th October, from 2nd sowing, 6th May.		2nd pulling, 3rd Novem'r, from 2nd sowing, 6th May.		1st pulling, 13th October, from 3rd sowing, 21st May.		2nd pulling, 3rd Novem'r, from 3rd sowing, 21st May.	
	Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1 Gate Post	33	1,485	38	725	26	800	28	1,255	16	1,330	38	230
2 Giant Yellow Globe	33		36	22	24	345	24	1,830	22	220	31	122
3 Golden Tankard	32	1,505	34	1,548	20	95	24	510	13	1,390	27	450
4 Yellow Intermediate	31	1,525	34	1,795	24	1,500	29	905	20	425	34	1,547
5 Giant Yellow Half-long	30	1,215	30	142	23	1,520	23	860	22	715	27	1,688
6 Mammoth Yellow Intermediate	30	390	28	183	26	305	24	675	18	1,455	24	965
7 Canadian Giant	28	595	27	1,440	20	95	23	365	16	1,660	32	597
8 Mammoth Long Red	27	1,770	27	1,687	23	1,355	23	1,850	16	670	27	1,192
9 Prize Mammoth Long Red	27	615	30	637	23	1,685	25	1,233	15	1,020	22	1,210
10 Giant Yellow Intermediate	26	1,130	24	15	23	860	23	35	17	1,145	28	925
11 Norbiton Giant	26	965	19	1,353	25	1,150	17	1,145	18	960	19	115
12 Golden Fleshed Tankard	24	1,665	30	1,627	16	1,165	22	1,375	13	730	29	657
13 Champion Yellow Globe	24	345	31	370	21	735	24	180	14	1,205	24	510
14 Ward's Large Oval-shaped	23	1,850	24	510	18	300	18	960	19	280	23	1,025
15 Warden Orange Globe	23	860	27	1,192	19	1,600	24	1,005	15	690	19	775
16 Selected Mammoth Long Red	23	860	17	155	20	260	15	1,845	16	1,990	16	175
17 Red Fleshed Globe	20	1,415	20	95	14	1,040	15	855	18	1,620	19	1,848
18 Gate Post Yellow	16	835	18	877	20	590	20	590	15	855	18	135
19 Red Fleshed Tankard	16	10	16	670	16	670	14	1,370	12	1,740	20	1,580

These figures show the following results :—

	Tons.	Lbs.
Average yield per acre from 1st sowing, 1st pulling ..	26	792
" " " 2nd " ..	27	479
An average gain in 21 days of 1,684 lbs. per acre.		
Average yield per acre from 2nd sowing, 1st pulling.	21	1,162
" " " 2nd " ..	22	676
An average gain in 21 days of 1,514 lbs. per acre.		
Average yield per acre from 3rd sowing, 1st pulling.	17	216
" " " 2nd " ..	25	1,255

An average gain in 21 days of 8 tons 1,039 lbs. per acre.

It will be observed that these comparative yields of the individual varieties are very irregular, and it is probable that other factors besides the extra time have influenced the yield, especially in the plots of the 3rd sowing.

Field Plots of Mangels.

The following five half-acre plots were all sown in the same field with the smaller plots reported on. The soil was similar and its preparation and treatment the same. These were all sown 6th May; came up 18th May, and the roots were pulled 24th to 26th October.

	Yield per acre. Tons.	Lbs.	Yield per acre. Bush.	Lbs.
Mangels, Yellow Intermediate..........	16	520	542	—
" Mammoth Long Red (Graham)..	20	1,505	691	45
" Champion Yellow Globe........	23	436	773	56
" Mammoth Long Red..........	20	1,471	691	11
" Gate Post....................	22	381	739	41

EXPERIMENTS WITH CARROTS.

Sixteen varieties of carrots were under trial in 1898. These were all sown side by side adjoining the turnips and mangels. The land was similar but rather lighter, and the treatment and preparation was the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Three sowings were made, the first on the 28th of April, the second on the 6th of May, and the third on the 21st of May, and after sowing, the same mixture of fertilizers that was used on the turnips was applied on the drills of the carrots in the proportion of 500 pounds per acre. The roots were all pulled on the 13th of October, and the yield per acre has been calculated from the weight of roots obtained from two rows each 66 feet long.

Carrots—Test of Varieties.

Name of Variety.	Yield per Acre, 1st Plot.		Yield per Acre, 1st Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 2nd Plot.		Yield per Acre, 3rd Plot.		Yield per Acre, 3rd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1 Mammoth White Intermediate.....	28	1,090	951	30	27	1,110	918	30	20	1,580	693	
2 Giant White Vosges...............	23	35	767	15	18	640	610	40	16	1,825	563	45
3 Improved Short White.....	22	1,870	764	30	22	220	737		16	1,185	553	5
4 Early Gem........................	22	1,705	761	45	20	1,415	690	15	18	1,785	629	45
5 Ontario Champion.................	21	1,230	720	30	13	730	445	30	13	400	440	
6 Iverson's Champion	21	900	715		19	280	638		17	1,815	580	15
7 Half Long White..........	20	95	668	15	21	1,560	726		21	75	701	15
8 Guerande or Ox Heart.............	19	1,600	660		19	280	638		17	980	583	
9 Green Top White Orthe	19	940	649		14	1,862	497	42	12	1,265	421	5
10 Half Long Chantenay..............	16	175	536	15	14	1,370	489	30	14	380	473	
11 Yellow Intermediate	14	1,370	489	30	13	1,225	453	45	13	70	434	30
12 White Belgian.....	14	710	478	30	18	1,950	632	30	14	50	467	30
13 Carter's Orange Giant...........	12	1,905	431	45	12	915	415	15	11	1,430	390	30
14 Long Orange or Surrey...........	12	750	412	30	11	605	376	45	9	1,635	327	15
15 Scarlet Intermediate.............	12	255	404	15	11	110	368	30	10	1,120	352	
16 Long Scarlet Altringham..	7	1,510	258	30	8	1,820	297		11	110	368	30
Average of all sowings........	18	278	....		16	1,506	....		14	1,969	....	

These results point to the importance of the early sowing of carrots.

These trial plots of carrots were sown in rows 200 feet or more in length, which gave opportunity for further experiment, after the two rows of 66 feet each had been

pulled to determine the yield per acre. A portion of the carrots in this area was left in the ground until later, to gain information as to what advantage, if any, results from leaving the roots in the ground after the middle of October. Sixteen plots were so left until the 3rd of November, which allowed 21 days for additional growth with the following results :—

CARROTS—YIELD PER ACRE FROM EARLY AND LATE PULLING.

Name of Variety.	1st pulling, 13th October, from 1st sowing, 28th April.		2nd pulling, 3rd Novem'r, from 1st sowing, 28th April.		1st pulling, 13th October, from 2nd sowing, 6th May.		2nd pulling, 3rd Novem'r, from 2nd sowing, 6th May.		1st pulling, 13th October, from 3rd sowing, 21st May.		2nd pulling, 3rd Novem'r, from 3rd sowing, 21st May.	
	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1 Mammoth White Intermediate	28	1,090	25	490	27	1,110	24	1,335	20	1,580	27	697
2 Giant White Vosges	23	35	23	1,520	18	640	18	135	16	1,825	20	95
3 Improved Short White	22	1,870	27	1,110	22	220	20	95	16	1,185	25	1,727
4 Early Gem	22	1,705	22	1,540	20	1,415	18	960	18	1,785	21	323
5 Ontario Champion	21	1,230	18	1,950	13	730	12	1,493	13	900	15	1,185
6 Iverson's Champion	21	900	24	1,170	19	280	19	857	17	1,815	19	610
7 Half Long White	20	95	23	865	21	1,560	19	610	21	75	18	1,620
8 Guerande or Ox Heart	19	1,600	19	1,930	19	280	17	897	17	980	19	1,105
9 Green Top White Orthe	19	940	18	960	14	1,862	15	1,185	12	1,265	15	1,140
10 Half Long Chantenay	16	175	16	422	14	1,370	18	630	14	380	13	1,720
11 Yellow Intermediate	14	1,370	15	690	13	1,225	13	400	13	70	14	1,943
12 White Belgian	14	710	16	175	18	1,950	15	1,928	14	50	14	457
13 Carter's Orange Giant	12	1,905	14	958	12	915	14	710	11	1,430	14	215
14 Long Orange or Surrey	12	750	12	255	11	605	11	770	9	1,635	10	1,780
15 Scarlet Intermediate	12	255	12	1,245	11	110	11	1,760	10	1,120	11	770
16 Long Scarlet Altringham	7	1,510	10	1,285	8	1,820	8	1,160	11	110	10	1,037

These figures show the following results :—

	Tons.	Lbs.
Average yield per acre from 1st sowing, 1st pulling....	18	278
" " 1st sowing, 2nd pulling.....	18	1,785

An average gain in 21 days of 1,507 pounds per acre.

Average yield per acre from 2nd sowing, 1st pulling ...	16	1,506
" " 2nd sowing, 2nd pulling...	16	432

An average loss in 21 days of 1,074 pounds per acre.

Average yield per acre from 3rd sowing, 1st pulling....	14	1,969
" " 3rd sowing, 2nd pulling...	17	151

An average gain in 21 days of 2 tons 182 pounds per acre.

FIELD PLOTS OF CARROTS.

The following five half-acre plots, and one quarter-acre plot, were all sown in the same field with the smaller plots of carrots. The soil was similar, and the preparation and treatment of the land the same. All were sown 6th May; came up 20th May and the roots were pulled 28th to 31st October.

	Yield per acre.		Yield per acre.	
	Tons.	Lbs.	Bush.	Lbs.
Mammoth White Intermediate	22	1,606	760	6
Improved Short White	22	1,480	758	..
Iverson's Champion	21	1,383	723	3
Pearce's Half Long White	19	1,416	656	56
Guerande	15	1,330	522	10
White Belgian, ½ acre	14	1,520	492	..

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were tested in 1898. The land was a sandy loam, adjoining that used for the test plots of turnips, mangels and carrots. The soil was similar and the treatment, preparation and method of sowing was the same. Three sowings were made, the first on the 28th of April, the second on the 6th of May, and the third on the 21st of May, and after sowing, the same mixture of fertilizers that was used on the turnips was applied on the drills of the sugar beets, in the proportion of 500 pounds per acre. The roots were all pulled on the 13th of October, and the yield per acre has been calculated from the weight of roots obtained from two rows each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.		Yield per Acre from 2nd Sowing.		Yield per Acre from 3rd Sowing.		Yield per Acre from 3rd Sowing.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1 Danish Improved....................	17	1,970	599	30	18	300	605		19	1,105	651	45
2 Wanzleben	15	1,020	517		16	340	539		19	280	6[illegible]8	
3 Danish Improved Red Top..........	14	1,700	495		14	1,390	489	50	28	430	94[illegible]	30
4 Improved Imperial......	13	1,720	462		15	525	508	45	19	1,765	662	45
5 Red Top Sugar.......	12	1,905	431	45	14	1,370	489	30	21	1,725	728	45
6 Vilmorin's Improved................	9	975	316	15	10	295	338	15	16	1,990	566	30
Average of all sowings........	14	215	....		14	1,703	....		20	1,882	....	

In this instance, the advantage in crop has been with the later sowings.

A portion of each of the varieties of sugar beets were also left in the ground after the first lots were pulled, to gain information as to what advantage, if any, results from leaving the roots in the ground for a longer period. Six plots were so left until the 3rd of November, which allowed 21 days for additional growth, with the following results:—

YIELD OF ROOTS PER ACRE FROM EARLY AND LATE PULLING.

	Name of Variety.	1st pulling, 13th October, from 1st sowing, 28th April.		2nd pulling, 3rd Novem'r, from 1st sowing, 28th April.		1st pulling, 13th October, from 2nd sowing, 6th May.		2nd pulling, 3rd Novem'r, from 2nd sowing, 6th May.		1st pulling, 13th October, from 3rd sowing, 21st May.		2nd pulling, 3rd Novem'r, from 3rd sowing, 21st May.	
		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Danish Improved..................	17	1,970	23	282	18	300	16	1,330	19	1,105	23	777
2	Wanzleben........	15	1,020	21	570	16	340	15	30	19	280	19	363
3	Danish Improved Red Top..	14	1,700	22	550	14	1,390	17	1,310	28	430	26	470
4	Improved Imperial....	13	1,720	24	1,500	15	525	14	50	19	1,765	20	1,085
5	Red Top Sugar..................	12	1,905	20	343	14	1,370	20	1,580	21	1,725	23	1,520
6	Vilmorin's Improved..............	9	975	18	1,372	10	295	13	1,720	16	1,990	21	1,065

These figures show the following results :—

	Tons.	Lbs.
Average yield per acre from 1st sowing, 1st pulling....	14	215
" " " 2nd " ...	21	1,436
An average gain in 21 days of 7 tons 1,221 lbs. per acre.		
Average yield per acre from 2nd sowing, 1st pulling...	14	1,703
" " " 2nd " ...	16	670
An average gain in 21 days of 1 ton 967 lbs. per acre.		
Average yield per acre from 3rd sowing, 1st pulling...	20	1,882
" " " 2nd " ...	22	880
An average gain in 21 days of 1 ton 998 lbs. per acre.		

EXPERIMENTS WITH POTATOES.

The report on the results of the tests made with varieties of potatoes will be found this year in the report of the Horticulturist, Mr. W. T. Macoun. The following table gives particulars of the results obtained from fifteen quarter-acre plots which were all grown adjoining each other in the same field. The land was similar throughout, and the preparation and treatment was the same for all. The soil was a light sandy loam, which was manured in the autumn of 1897 with about 12 tons of barn-yard manure per acre. The previous crop was hay. The land was ploughed in the spring of 1898, about 6 inches deep, and harrowed twice with the smoothing harrow, then made into drills 2½ feet apart and 6 inches deep for planting.

Field Plots of Potatoes.

Name of Variety.	Size of Plot.	When Planted.	Came up.	When dug.	Yield per acre. Bush.	Lbs.
American Wonder	¼ acre.	May 17	May 30	Sept. 29	299	35
Early Harvest	¼ "	" 17	" 30	Oct. 10	286	
Burnaby Seedling	¼ "	" 17	" 31	Sept. 30	270	38
Carman No. 1	¼ "	" 17	" 31	Oct. 8	262	46
Queen of the Valley	¼ "	" 17	" 31	" 10	257	12
Late Puritan	¼ "	" 17	" 31	" 10	256	45
Dakota Red	¼ "	" 17	" 31	" 6	251	52
Wonder of the World	½ "	" 17	" 31	" 7	247	19
Rochester Rose	¼ "	" 17	" 31	Sept. 29	237	33
Everett	¼ "	" 17	" 30	" 29	226	5
Early Rose	¼ "	" 17	" 31	Oct. 6	221	9
Daisy	½ "	" 18	" 31	" 6	218	47
I. X. L.	¼ "	" 18	" 31	" 7	202	29
Burpee's Extra Early	¼ "	" 18	" 31	Sept. 29	193	41
May Queen Early	¼ "	" 18	" 31	Oct. 7	172	15

EXPERIMENTS WITH CLOVER.

The many experiments which have been conducted with clover at the Central Experimental Farm during the last four years have attracted much attention, especially those which have been made of sowing red clover with grain, and the ploughing under of the green clover crop late in the season to enrich the land. This subject has been much discussed, and by many the method recommended has been practised with manifest benefit.

Further trials have been made during the past season, and some very convincing results obtained as to the value of this green crop as a fertilizer when ploughed under.

On page 33 of the Annual Report of the Experimental Farms for 1897, reference was made to eight trial plots of grain grown that year of $\frac{1}{20}$ acre each, four of which had been sown with red clover, and the clover crop subsequently ploughed under, while on the other four plots the grain was sown without clover. Plots Nos. 1 and 2 had been sown with Preston wheat, Nos. 3 and 4 with Odessa barley (six-rowed), Nos. 5 and 6 with Bolton barley (two-rowed), and Nos. 7 and 8 with Banner oats. In each instance on one plot Red clover in the proportion of 10 pounds to the acre had been sown with the grain, while on the other plot the grain was sown without clover.

In October, 1897, this land was all ploughed about 8 inches deep, and in the spring of 1898 it was disc-harrowed and twice harrowed with the smoothing harrow, after which all the plots were sown with one variety of oats, the Banner. The oats were sown on the 27th of April and came up on the 6th of May. The difference in the growth of the grain on these plots was soon very noticeable, and as the season advanced, especially just before the heads appeared, the difference in height and vigour of growth in favour of the plots where the clover had been grown was very remarkable. So clearly was this manifest that the difference could be distinctly seen at a considerable distance, and the outline of those plots on which no clover had been grown could be readily traced by the manifestly shorter and less vigorous growth. After the grain was fully headed, the difference in appearance was not so clearly seen at a distance, but by a careful examination it could be easily traced. When ready to harvest the boundaries of the several plots were accurately marked, they were cut and threshed separately and the following particulars obtained :—

Results.	Straw, yield per Acre.	Oats, yield per Acre.	
	Lbs.	Bush.	Lbs.
Plot 1—On which Preston wheat was sown in 1897 with clover	3,770	56	6
Plot 2—After Preston wheat without clover	2,160	37	2
An increase in yield of oats after wheat on the plot with clover of 19 bushels 4 pounds per acre with an added weight of straw of 1,610 pounds.			
Plot 3—On which Odessa barley was sown in 1897 with clover	2,180	37	12
Plot 4—After Odessa barley without clover	1,450	30	10
An increase in yield of oats after barley on the plot with clover of 7 bushels 2 pounds per acre with an added weight of straw of 730 lbs.			
Plot 5—On which Bolton barley was sown in 1897 with clover	3,180	51	26
Plot 6—After Bolton barley without clover	2,090	44	24
Showing an increase in yield of oats after barley on the plot with clover of 7 bushels 2 pounds per acre with an added weight of straw of 1,090 lbs.			
Plot 7—On which Banner oats was sown in 1897 with clover	5,110	55	0
Plot 8—After Banner oats without clover	2,260	44	4
An increase in yield of oats after oats on the plot with clover of 10 bushels 30 pounds per acre with an added weight of straw of 2,850 pounds.			

The lower yields reported on plots 3 and 4 were due to the poor quality of the soil, which was a light sandy loam. The other plots alongside had a heavier sandy loam soil of much better quality.

The results of these tests are very encouraging, the average increase in the yield of grain on the four plots with clover being over 11 bushels per acre more than on those where no clover was used.

RESULTS OF GROWING INDIAN CORN AFTER CLOVER.

Favourable results have also been had from a series of plots on which Indian corn was planted after clover of different varieties and grown from different quantities of seed per acre had been ploughed under. These tests were conducted on 15 plots of $\frac{1}{20}$ acre each which were sown with a grain crop in 1897 when different sorts and

quantities of clover were sown with the grain, excepting plots 7, 10 and 12, which were left as check plots, on which the same sort of grain was sown, but without clover. The soil was a sandy loam of fair quality which received a dressing of about 12 tons of barn-yard manure per acre in the fall of 1896. No fertilizer has been applied since. In this case the clover was allowed to remain during the winter and to grow until the 23rd of May following, by which time most of the plots had made a heavy growth, when the land was all ploughed about 6 or 7 inches deep, and harrowed twice with the smoothing harrow before planting.

The variety of corn chosen for this test was the Longfellow, which was planted on the 25th of May with the seed drill in rows 3 feet apart, and was cut on the 15th of September. This corn made a medium and even growth of from 7 to 8 feet, was leafy from top to bottom, and the stalks were well eared, many of the ears then beginning to ripen. The following results were obtained :—

QUANTITY AND KIND OF CLOVER SOWN, 1897.

Plot.	Varieties of Clover Sown.	1898. Yield of Fodder Corn per Acre.	
		Tons.	Lbs.
1	Mammoth Red clover 4 lbs. per acre	15	560
2	" " " 6 lbs. "	15	1,720
3	" " " 8 lbs. "	15	1,440
4	" " " 10 lbs. "	15	1,360
5	" " " 12 lbs. "	16	1,920
6	" " " 14 lbs. "	17	1,860
7	Check plot, no clover sown	13	160
8	Common red clover, 10 lbs. per acre	22	200
9	Alsike clover, 6 lbs. per acre	15	640
10	Check plot, no clover sown	14	960
11	Alfalfa, 14 lbs. per acre	14	1,320
12	Check plot, no clover sown	13	280
13	Crimson clover, 24 lbs. per acre	14	20
14	Alsike, 6 lbs., Orchard grass, 14 lbs. per acre	19	200
15	Alfalfa, 6 lbs., Orchard grass, 14 lbs. "	14	1,280

These results clearly show the influence of the green clover as a fertilizer.

The beneficial effects on subsequent crops observed when clover is ploughed under is due largely to the fact that clover in common with most other leguminous plants has the power of taking nitrogen—one of the most valuable of fertilizers—from the air and laying this up in its roots and leaves, and when these are buried in the soil by ploughing the added fertility becomes available as plant food for subsequent crops. If a clover plant be dug there will be found attached to its fine branching roots many small nodules or swellings, each of which contains a colony of bacteria, and these microscopic organisms are the active agents employed in taking nitrogen from the air and converting it into plant food. Cultures are now made of these bacteria and sold under the name of Nitragin, to promote the growth of clover.

The extensive root system also which clover plants have, enables them to penetrate deeper in the soil than other plants, and to draw from the lower portions of the soil and subsoil other important constituents which growing plants require, and when the clover is turned under and decays, these also become available to after crops. Green crops when ploughed under also improve the texture of the soil by adding to it organic matter and thus make it more retentive of moisture and more suitable for sustaining plant growth.

RESULTS OF SOWING GRAIN WITH AND WITHOUT CLOVER.

Further experiments along this line have been tried during the past year at the Central Experimental Farm which furnish additional proof of the fact that the sowing of clover with grain does not affect the crop of grain for that year. The variations in yield shown in the series of results given below are no doubt due mainly to slight variations in the quality of the soil. The soil was a sandy loam of fair quality which was manured during the winter of 1896-97 with about 15 tons of barn-yard manure per acre. No fertilizer of any sort has been applied since. The previous crop was horse beans. The land was ploughed in the autumn of 1897, about 8 inches deep, disc-harrowed in the spring and harrowed twice with the smoothing harrow before sowing. The plots were all sown on the 27th of April, came up 6th of May, and was ripe from 25th to 30th of July. The wheat was sown at the rate of $1\frac{1}{2}$ bushels per acre; barley, six-rowed, $1\frac{3}{4}$ bushels; barley, two-rowed, 2 bushels; and oats, 2 bushels per acre. The wheat was ripe 30th July, six-rowed barley, 25th July, two-rowed barley and oats, 27th July.

GRAIN SOWN WITH AND WITHOUT CLOVER.

Plot.	Name of Variety.	Yield per Acre. Bush.	Lbs.
1	Preston wheat with 10 lbs. clover seed per acre	31	40
2	" " without clover	26	50
3	Odessa barley with 10 lbs. clover seed per acre	56	42
4	" " without clover	55	30
5	Bolton barley with 10 lbs. clover seed per acre	52	44
6	" " without clover	54	48
7	Banner oats with 10 lbs. clover seed per acre	87	32
8	" " without clover	89	14
9	Mensury barley with 4 lbs. Mammoth Red clover seed per acre	46	22
10	" " 6 lbs. " " " "	40	30
11	" " 8 lbs. " " " "	34	8
12	" " 10 lbs. " " " "	42	4
13	" " 12 lbs. " " " "	44	28
14	" " 14 lbs. " " " "	44	8
15	" " 10 lbs. Common Red clover seed per acre	34	38
16	" " without clover	42	16
17	" " with 8 lbs. Alsike clover seed per acre	36	12
18	" " 6 lbs. " "	43	46
19	" " 14 lbs. Alfalfa " "	39	28
20	" " without clover	41	22

WEIGHT OF CLOVER LEAVES, STEMS AND ROOTS PER ACRE.

Some further examinations were made during 1898 to ascertain the weight of the leaves and stems also of the roots per acre on land which had been sown with different quantities of seed. Such plots of the Mensury barley mentioned above as were sown with clover were chosen for this test. An area of 4 feet by 4 (16 square feet) was dug to the depth of 9 inches, and all the roots and tops of the clover carefully gathered and weighed, and the weight of the material thus collected formed the basis of the estimate of the weight per acre. These were dug on the 5th of November.

Plot 9. Mensury barley with 4 pounds Mammoth Red clover seed per acre:—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	2	1,189
" roots per acre	2	934
Total	5	123

Plot 10. Mensury barley with 6 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	2	764
" roots per acre	2	1,870
Total	5	634

Plot 11. Mensury barley with 8 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	2	1,785
" roots per acre	2	1,870
Total	5	1,655

Plot 12. Mensury barley with 10 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	3	806
" roots per acre	3	456
Total	6	1,262

Plot 13. Mensury barley with 12 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	3	551
" roots per acre	3	210
Total	6	761

Plot 14. Mensury barley with 14 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	3	380
" roots per acre	3	1,486
Total	6	1,866

Plot 15. Mensury barley with 10 pounds Common Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	2	1,955
" roots per acre	2	1,615
Total	5	1,570

Plot 17. Mensury barley with 8 pounds Alsike clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	1	1,658
" roots per acre	2	509
Total	4	167

Plot 18. Mensury barley with 6 pounds Alsike clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	2	509
" roots per acre	2	1,615
Total	5	124

Plot 19. Mensury barley with 14 pounds Alfalfa seed per acre :—

	Tons.	Lbs.
Weight of Alfalfa leaves and stems per acre	1	892
" roots per acre	1	41
Total	2	933

WEIGHT OF CLOVER LEAVES AND STEMS AND ROOTS ON PLOTS ALLOWED TO GROW UNTIL SECOND YEAR.

In the annual report of the Experimental Farms for 1897, page 37, reference is made to the weights of leaves and stems and roots per acre of clover in a series of plots ranging from Nos. 5 to 17, all of which were sown with Odessa barley on the 6th of May, 1897, with different quantities and kinds of clover; and on the 20th of October of that year the weight of the leaves, stems and roots were ascertained in the manner already explained and the results published in that report.

These plots were not ploughed in the autumn but the clover was left undisturbed until the 21st of May, 1898, by which time it had made a strong and heavy mat of growth and the plants had reached a height of nearly 2 feet.

Similar blocks to those already referred to, 9 inches deep and covering 16 square feet, were cut out of these plots on the 21st of May, when the following results were obtained :—

Plot 5. Sown with 4 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	6	1,442
" roots per acre	6	1,783
Total	13	1,225

Plot 7. Sown with 6 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	7	1,484
" roots per acre	5	1,741
Total	13	1,225

Plot 8. Sown with 8 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	8	1,356
" roots per acre	6	1,783
Total	15	1,139

Plot 9. Sown with 10 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	9	887
" roots per acre	7	633
Total	16	1,520

Plot 10. Sown with 12 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	8	1,356
" roots per acre	6	1,272
Total	15	628

Plot 11. Sown with 14 pounds Mammoth Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	8	845
" roots per acre	4	1,358
Total	13	203

Plot 12. Sown with 10 pounds Common Red clover seed per acre :—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	9	717
" roots per acre	6	421
Total	15	1,138

Plot 14. Sown with 14 pounds Alfalfa seed per acre:—

	Tons.	Lbs.
Weight of Alfalfa leaves and stems per acre	3	816
" roots per acre	2	254
Total	5	1,070

Plot 17. Sown with 6 pounds Alsike clover per acre:—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	11	631
" roots per acre	4	1,018
Total	15	1,649

These figures give much food for thought. They show an enormous increase in the useful fertilizing material which can be had, when clover is left over, for ploughing under in time for an Indian corn or potato crop, and indicate that the best results are likely to attend the pasturing of the clover in the autumn, and leaving it to be turned under in May following.

Thirty-six acres of field crops, chiefly oats and barley, were sown with clover last spring; the plants made good growth, although not quite so strong as in 1897 Nevertheless there was a fine mass of leaves, stems and roots turned under with the late autumn ploughing.

Results of Sowing Clover Seed Treated with Nitragin.

Experiments were tried during the past year in the sowing of clover seed inoculated with a culture of Nitragin. This material was obtained in bottles from the manufacturers, Messrs. Meister, Lucius & Bruning, of Germany. As received, the material was in a soft, gelatinous condition, easily liquified when slightly warmed. This was diluted with water in the manner and quantity directed and sprinkled on the clover seed which was subsequently dried, partly by exposure and partly with dry sand. Before treatment a definite weight of clover seed, sufficient for the experiments to be undertaken, was set aside for treatment, and a similar weight of the same lot of seed put by for use in the untreated condition. Each of these lots were divided into five portions, one of which was reserved for the trials to be made at the Central Farm, and the other four portions were sent to the branch farms.

The following are the results obtained at the Central Farm. The seed was sown on sandy loam on the 14th of June at the rate of 10 lbs. per acre. Both lots of seed germinated well and made good growth. On casual examination both looked very much alike as to strength and vigour, but on a more careful scrutiny the treated seed appeared to promise the best results.

On the 24th of November a piece of the soil 2 feet by 2 (8 square feet) and 9 inches deep was cut out of each plot, and the leaves, roots and tops carefully gathered, when the following particulars were obtained:

Plot 1. Seed inoculated with Nitragin:—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	4	507
" " roots per acre	4	167
Total	8	674

Plot 2. Seed untreated:—

	Tons.	Lbs.
Weight of clover leaves and stems per acre	2	1445
" " roots per acre	2	760
Total	5	205

From this experiment it would appear that there may be a decided advantage in using Nitragin to inoculate the seed of clover under some conditions.

EXPERIMENTS WITH SOJA BEANS.

(Soja hispida.)

The Soja or Soya bean was first grown at the Central Experimental Farm as a fodder plant in 1897, when two varieties, a late and an early sort were tested. The early variety, the seed of which was obtained from Peter Henderson & Co., seedsmen, of New York, proved very promising and produced on the small plot grown a weight of fodder equal to 15 tons 855 lbs. per acre. In this case the beans were sown in rows 9 inches apart. Further experiments have been tried with this early ripening Soja bean during the past season, when two sets of plots were sown at different dates and of different widths in the rows with the object of finding out the best time to plant and the most profitable method of planting. The soil was a sandy loam of good quality, which received a dressing of fresh barn-yard manure of about twelve tons per acre, distributed in small piles of about one-third of a cart load each during the winter of 1897-98. This was spread in the spring. The previous crop was hay. The land was ploughed very lightly after the hay was taken off, and disc-harrowed and cultivated at intervals during the remainder of the season to keep down all growth. In the spring of 1898, the land was ploughed about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. The beans were sown with the seed drill, from 1 to 2 inches apart in the rows.

Plot 1. Soja beans, sown in drills 35 inches apart. Sown 26th April, came up 14th May, and was cut for ensilage 12th September. The growth was strong and even, the plants were very leafy and grew to an average height of 42 to 46 inches, and they were very well podded. The beans in the pods were full-grown and beginning to harden at the time of cutting. The weight of green fodder was at the rate of 9 tons 520 pounds per acre.

Plot 2. Sown in drills 28 inches apart. Sown 26th April, came up 14th May, and was cut for ensilage 12th September. The growth was strong and even, the plants were very leafy and grew to an average height of 42 to 48 inches. They were very well podded, and the beans in the pods were full-grown and beginning to harden at the time of cutting. The weight of green fodder was 9 tons 890 pounds per acre.

Plot 3. Sown in drills 21 inches apart. Sown 26th April, came up 14th May, and was cut for ensilage 12th September. The growth was strong and even, the plants were very leafy and grew to an average height of 42 to 44 inches. They were very well podded, and the beans in the pods were full grown and beginning to harden at the time of cutting. The weight of green fodder was 10 tons 1,760 pounds per acre.

Plot 4. Sown in drills 21 inches apart. Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was strong and even, the plants were very leafy and grew to an average height of 42 to 44 inches. They were very well podded, and the beans in the pods were full grown and beginning to harden at the time of cutting. The beans appeared to be as far advanced in ripening in this plot as in those sown 26th April. The weight of green fodder was 11 tons 1,480 pounds per acre.

Pot 5. Sown in drills 14 inches apart. Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was strong and even, the plants were very leafy and grew to an average height of 42 inches. The plants were not as strong or woody in this plot as in the former; would have lodged very easily. They were fairly well podded and the beans were beginning to harden at the time of cutting. The weight of green fodder was 12 tons 1,800 pounds per acre.

Plot 6. Sown in drills 7 inches apart. Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was strong and even, the plants were very leafy and grew to an average height of 40 to 42 inches. The plants were not so strong or woody as where they were wider sown; would have easily lodged. They were fairly well podded, but the pods were not nearly as plentiful as when sown in rows 21 inches apart or as ripe at the time of cutting. The weight of green fodder was 12 tons 1,260 pounds per acre.

From these experiments it would appear that the best results may be looked for from planting these beans about the middle of May in drills 14 inches apart.

EXPERIMENTS WITH HORSE BEANS.

Two sets of plots were sown at different dates, and of different widths, during 1898. The soil was a sandy loam of good quality, which received a coating of barn-yard manure of about 12 tons per acre, distributed in small piles of about one-third of a cart load each, during the winter of 1897-98 which was spread in the spring. The previous crop was hay. The land was ploughed very lightly when the hay was taken off, and cultivated at short intervals afterwards to keep down all growth until autumn. In the spring of 1898, it was again ploughed about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. The beans were sown with the seed drill.

Plot 1. Tick beans, imported seed. The seed on this plot was sown in rows 35 inches apart. Sown 26th April, came up 14th May, and was cut 25th August. The growth was weak and even. Height 30 to 38 inches. Blight was first noticed on the leaves on 27th July, and spread so rapidly that all the plots had to be cut on 26th August. Yield per acre, 2 tons 340 pounds.

Plot 2. Seed sown in rows 28 inches apart. Sown 26th April, came up 14th May, and was cut 25th August. The growth was weak and even. Height 30 to 38 inches. Yield per acre, 2 tons 340 pounds.

Plot 3. Seed sown in rows 21 inches apart. Sown 26th April, came up 14th May, and was cut 25th August. The growth was weak and even. Height 30 to 38 inches. Yield per acre, 2 tons 1,940 pounds.

Five additional plots were sown adjoining the first three. The soil was similar, and the preparation and treatment of the land the same.

Plot 4. Seed sown in rows 35 inches apart. Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was weak and even. Height 36 to 40 inches. Well podded, and a large proportion of the beans ripe. Yield per acre, 4 tons 1,840 pounds.

Plot 5. The seed on this plot was sown in rows 28 inches apart. Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was weak and even. Height 36 to 40 inches, well podded, and a large proportion of the beans ripe. Yield per acre, 4 tons 1,360 pounds.

Plot 6. The seed was sown in rows 21 inches apart. Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was weak and even. Height 36 to 40 inches, well podded, and a large proportion of the beans were ripe. Yield per acre, 3 tons 1,730 pounds.

Plot 7. The seed was sown in rows 14 inches apart Sown 17th May, came up 31st May, and was cut for ensilage 12th September. The growth was weak and even. Height 36 to 40 inches, fairly well podded, not as many as on plot 3, beans beginning to ripen. Yield per acre, 3 tons 1250 pounds.

Plot 8. The seed was sown in rows 7 inches apart. Seed sown and cut for ensilage on same dates as No. 7. The growth was weak and even. Height 36 to 40 inches. There were very few pods. Pods beginning to ripen. Yield per acre, 2 tons 1,730 pounds.

Field Plots of Horse Beans.

Two field plots of half an acre each were sown with horse beans during 1898. The soil was a heavy sandy loam of good quality, partly clay, which was manured in the autumn of 1894 with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. It was ploughed in the autumn of 1897, about 8 inches deep, and in the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. The beans were sown with the grain drill in rows 3 feet apart, using about 50 pounds of seed per acre.

Plot 1. One half acre. Tick beans, imported seed. Sown 26th April, came up 14th May, and was cut for seed 22nd August. The growth was weak and even, vines fairly well podded, pods quite ripe. Height 30 to 33 inches. Blight was first

noticed on the leaves 27th July, and spread so rapidly up to 22nd August, that all had to be then cut. Yield per acre, 3 tons 304 pounds; yield of seed per acre, 10 bushels 72 pounds.

Plot 2. One-half acre. This was adjoining plot 1, on similar soil and the land had similar preparation and treatment. The seed was also of the variety known as Tick, but of Canadian growth. Sown 26th April, came up 14th May, and was cut for seed 22nd August. The growth was weak and even, vines fairly well podded, pods quite ripe. Height 30 to 33 inches. Blight was first noticed on the leaves 27th July. Yield per acre, 3 tons 740 pounds; yield of seed per acre, 9 bushels 8 pounds.

EXPERIMENTS WITH SUNFLOWERS.

Two field plots covering 1 acre were sown with this crop. The soil was a heavy sandy loam, partly clay, of good quality, which was manured in the autumn of 1894 with about 18 tons of barn-yard manure per acre. No fertilizer has been applied since. The previous crop was oats. It was ploughed in the autumn of 1897, about 8 inches deep, and in the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. The seed was sown with the grain drill in rows 3 feet apart, using 3 to 4 pounds of seed per acre, and the plants were thinned out when they were 3 or 4 inches high so as to leave them from 18 to 20 inches apart in the rows.

Plot 1. One-half acre. Mammoth Russian Sunflowers, black seeded variety. Sown 26th April, came up 11th May, and the heads were quite ripe when cut for the silo on 9th September. The plants were of medium growth, and the yield of heads was 5 tons 970 pounds per acre.

Plot 2. One-half acre. Mammoth Russian Sunflowers, light coloured seed. Sown 26th April, came up 11th May, and the heads were quite ripe when cut for the silo on 9th September. The plants were of medium and even growth. Yield of heads per acre, 5 tons 990 pounds.

EXPERIMENTS WITH FLAX.

The experiments which were begun with flax in 1896 to gain information as to the best time for sowing and the quantity of seed which should be sown to give the heaviest crops, have been continued. The soil was a sandy loam of medium quality, rather heavy, which was manured during the winter of 1896–97 with about 15 tons of barn-yard manure per acre. The previous crop was horse beans. The land was ploughed in the autumn of 1897, about 8 inches deep, and in the following spring it was disc-harrowed once and harrowed twice with the smoothing harrow before sowing.

FIRST SOWING.

Plot 1. Forty pounds of seed per acre. Sown 25th April, came up 8th May, and was ripe 29th July. Made a strong and even growth, all standing well.

Weight of straw per acre.......................... 3,200 pounds.
Yield of seed per acre.......................... 13 bushels 12 pounds.

Plot 2. Eighty pounds of seed per acre. Seed sown and ripened on same dates as plot 1. Made a strong even growth, all standing well.

Weight of straw per acre.......................... 3,390 pounds.
Yield of seed per acre.......................... 13 bushels 42 pounds.

SECOND SOWING.

Plot 3. Forty pounds of seed per acre. Sown 2nd May, came up 11th May, and was ripe 29th and 30th July. Made a medium and even growth, all standing well.

Weight of straw per acre.......................... 2,960 pounds.
Yield of seed per acre.......................... 9 bushels 16 pounds.

Plot 4. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 3. Made a strong and even growth, all standing well.

Weight of straw per acre.......................... 3,260 pounds.
Yield of seed per acre.......................... 11 bushels 44 pounds.

THIRD SOWING.

Plot 5. Forty pounds of seed per acre. Sown 9th May, came up 17th May, and was ripe 6th August. Made a medium and even growth, all standing well.

Weight of straw per acre........................2,880 pounds.
Yield of seed per acre.......................8 bushels 32 pounds.

Plot 6. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 5. Made a medium and even growth, all standing well.

Weight of straw per acre........................2,580 pounds.
Yield of seed per acre.....................12 bushels 18 pounds.

FOURTH SOWING.

Plot 7. Forty pounds of seed per acre. Sown 16th May, came up 23rd May, and was ripe 9th August. Made a medium and even growth, all standing well.

Weight of straw per acre........................2,150 pounds.
Yield of seed per acre.......................7 bushels 18 pounds.

Plot 8. Eighty pounds of seed per acre. Seed sown and ripe on same dates as plot 7. Made a medium and even growth, all standing well.

Weight of straw per acre........................2,630 pounds.
Yield of seed per acre.....................11 bushels 54 pounds.

These four sets of plots were sown a week apart, beginning with the 25th of April. On the first plot in each group 40 pounds of seed were used, and on the second 80 pounds. The heaviest weights both of seed and straw have been obtained from the earliest sown plots.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued; and as explanatory regarding the preparations made and the general plan, together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893 :—

"A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded 6 inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles, on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping.

"The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. It was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn, and in 1889 all the series

were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890." In all cases the plots in each series have been sown on the same day.

"In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year." In 1894, 1895, 1896, 1897 and 1898 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

TREATMENT OF SOIL.

"The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again later, about 7 inches deep. In spring the plots have been gang-ploughed once before applying the fertilizers, which are then scattered over the surface and harrowed with the smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and just before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions."

A summary of these permanent fertilizer plots is given each year, taking the average yield of the whole of the previous period, adding the results of the current year, and then giving the average yield for the full time.

CHANGES IN THE FERTILIZERS USED.

Ten years' experience has shown that the finely ground untreated mineral phosphate is of no value as a fertilizer. This substance has been heretofore used every year on wheat, on plots 4, 5, 6, 7 and 8, also on the plots similarly numbered in the experiments with fertilizers on barley, oats, Indian corn, carrots and potatoes, and in the experiments on roots on plots 4, 5, 6 and 7. In all these plots the use of the finely ground untreated mineral phosphate has been discontinued this year and in its place similar weights of the Thomas' phosphate powder used.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, excepting in 1894; and the varieties used were as follows: In 1888-89-90 and 1891 White Russian, and in 1892-93 Campbell's White Chaff. In 1894 the Rio Grande wheat was used, and shortly before sowing it was tested as to vitality and found to be deficient in germinating power,—less than half the kernels sprouted. As it was not practicable then to secure better seed, double the usual quantity was sown, namely, three bushels per acre, which gave a proportion of growth on each plot of about the usual thickness. In 1895, 1896, 1897 and 1898 Red Fife wheat was used in the usual quantity of 1½ bushels per acre. In 1898 the Red Fife was sown 27th April, came up 8th May and was harvested 4th August, requiring from the date of sowing to maturity a period of 99 days.

The season of 1898 at Ottawa has been fairly good for the growing of spring wheat, and has given in general, crops above the average. In the plots referred to in the following table, those treated with barn-yard manure have exceeded the average of past years, all the others have fallen below it.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Ten Years. Yield of Grain. Per acre.		Yield of Straw. Per acre	11th Season, 1898. Variety, Red Fife. Yield of Grain. Per acre.		Yield of Straw. Per acre	Average Yield for Eleven Years. Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year since...	20	..	3,544	30	20	5,360	20	56$\frac{4}{11}$	3,709
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year since.........	20	4$\frac{1}{10}$	3,598	28	55	4,710	20	52$\frac{4}{11}$	3,699
3	Unmanured..........	10	36	1,869	7	..	2,200	10	16$\frac{4}{11}$	1,899
4	Thomas' phosphate, 500 lbs. per acre.....	10	33$\frac{5}{10}$	1,893	8	30	2,190	10	22$\frac{3}{11}$	1,920
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre.........	12	43	2,895	10	50	2,570	12	32$\frac{8}{11}$	2,865
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using..................	17	56$\frac{5}{10}$	3,004	20	40	4,000	18	11$\frac{7}{11}$	3,094
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre..........	12	50$\frac{4}{10}$	2,188	11	30	2,710	12	43$\frac{3}{11}$	2,235
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....... ...	10	51$\frac{5}{10}$	1,693	9	..	3,610	10	41$\frac{7}{11}$	1,867
9	Mineral superphosphate, No. 1, 500 lbs. per acre...	11	48$\frac{5}{10}$	1,738	9	40	2,160	11	37$\frac{1}{11}$	1,776
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	13	8	2,967	10	10	3,710	12	51$\frac{9}{11}$	3,035
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre..........	13	48	2,676	10	40	2,450	13	30$\frac{10}{11}$	2,665
12	Unmanured.............................	9	58	1,635	7	20	1,800	9	43$\frac{7}{11}$	1,650
13	Bone finely ground, 500 lbs. per acre......	11	48$\frac{3}{10}$	1,807	10	20	2,100	11	40$\frac{3}{11}$	1,834
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.....	15	16$\frac{5}{10}$	2,225	14	30	2,800	15	12$\frac{3}{11}$	2,274
15	Nitrate of soda, 200 lbs. per acre..........	13	43$\frac{5}{10}$	2,316	9	50	2,140	13	22$\frac{3}{11}$	2,300
16	Muriate of potash, 150 lbs. per acre.......	15	36$\frac{3}{10}$	1,981	12	40	2,200	15	20$\frac{3}{11}$	2,001
17	Sulphate of ammonia, 300 lbs. per acre....	12	0$\frac{2}{10}$	2,335	9	10	1,700	11	44$\frac{3}{11}$	2,277
18	Sulphate of iron, 60 lbs. per acre..........	12	49$\frac{5}{10}$	1,843	9	30	1,810	12	31$\frac{4}{11}$	1,840
19	Common salt (Sodium chloride) 300 lbs. per acre..	13	16$\frac{5}{10}$	1,625	13	..	1,780	13	15	1,639
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre......................	12	57	1,878	9	..	1,900	12	35$\frac{5}{11}$	1,880
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre, each year since..	12	33$\frac{8}{10}$	1,850	11	10	1,850	12	26$\frac{2}{11}$	1,850

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897 and 1898. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894, 1895, 1896, 1897 and 1898, Canadian Thorpe, a selected form

of the Duck-bill. In 1898 the Canadian Thorpe was sown on 28th April, came up 8th May and was harvested 8th August, requiring from the date of sowing to maturity a period of 102 days.

In 1898 the yield of all the barley plots has been less than the average of past seasons, excepting the two plots fertilized with barn-yard manure, which have exceeded the average.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE.

Number of Plot.	Fertilizers applied each Year.	Average Yield for Nine Years.			10th Season, 1898. Variety, Canadian Thorpe.			Average Yield for Ten Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Peracre.	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	33	$42\frac{3}{9}$	3,052	42	14	3,070	34	$34\frac{7}{10}$	3,054
2	Barn-yard manure, fresh, 15 tons per acre..	34	$45\frac{8}{9}$	3,305	39	38	3,060	35	$21\frac{1}{10}$	3,280
3	Unmanured	14	$14\frac{1}{9}$	1,592	8	6	1,610	13	$32\frac{5}{10}$	1,594
4	Thomas' phosphate, 500 lbs. per acre	14	$26\frac{1}{9}$	1,463	7	44	1,530	13	$42\frac{3}{10}$	1,470
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre	19	$36\frac{5}{9}$	2,224	13	46	1,570	19	$8\frac{7}{10}$	2,159
6	Barn-yard manure, partly rotted, and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	28	$10\frac{1}{9}$	2,466	27	4	2,200	28	$4\frac{7}{10}$	2,439
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	22	$47\frac{6}{9}$	2,404	18	26	1,860	22	$26\frac{3}{10}$	2,350
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	19	$35\frac{2}{9}$	1,702	15	40	1,440	19	$16\frac{5}{10}$	1,676
9	Mineral superphosphate, No. 1, 500 lbs. per acre	21	$36\frac{4}{9}$	2,023	16	2	1,530	21	9	1,974
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	26	$35\frac{8}{9}$	2,452	23	36	1,760	26	$21\frac{5}{10}$	2,383
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	26	$13\frac{6}{9}$	2,568	20	20	2,220	25	$33\frac{5}{10}$	2,533
12	Unmanured	13	$36\frac{5}{9}$	1,242	8	46	1,080	13	$13\frac{5}{10}$	1,226
13	Bone, finely ground, 500 lbs. per acre	14	$6\frac{8}{9}$	1,376	10	..	1,420	13	35	1,380
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	22	$5\frac{6}{9}$	2,020	21	12	1,680	22	$1\frac{5}{10}$	1,986
15	Nitrate of soda, 200 lbs. per acre	22	$37\frac{3}{9}$	2,468	9	28	1,440	21	22	2,365
16	Muriate of potash, 150 lbs. per acre	22	24	1,947	16	12	1,240	21	42	1,876
17	Sulphate of ammonia, 300 lbs. per acre	18	$4\frac{3}{9}$	2,068	13	6	1,420	17	$28\frac{5}{10}$	2,003
18	Sulphate of iron, 60 lbs. per acre	18	$34\frac{3}{9}$	1,794	9	38	1,170	17	$35\frac{5}{10}$	1,732
19	Common salt (Sodium chloride) 300 lbs. per acre	28	$30\frac{4}{9}$	2,143	23	16	1,850	28	5	2,114
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre	20	35	1,766	11	32	1,020	19	$39\frac{5}{10}$	1,691
21	Mineral superphosphate, No. 2, 500 lbs. per acre	21	$30\frac{8}{9}$	1,721	10	30	1,100	20	26	1,860

OAT PLOTS.

The quantity of seed sown per acre on the oat plots, was 2 bushels in 1889 and 1890; $1\frac{1}{2}$ bushels in 1891, 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897 and 1898. The varieties used were as follows: In 1889, Early English; 1890, 1891, 1892, 1893, Prize Cluster; and in 1894, 1895, 1896, 1897 and 1898, Banner. In 1898 the Banner was sown 27th April, came up the 8th May, and was harvested 1st August, requiring from the date of sowing to maturity a period of 96 days.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$TH ACRE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Nine Years.			10th Season, 1898. Variety, Banner.			Average Yield for Ten Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	46	$23\frac{7}{9}$	3,191	63	28	3,630	48	14	3,235
2	Barn-yard manure, fresh, 15 tons per acre	53	$19\frac{1}{9}$	3,452	62	32	3,570	54	17	3,467
3	Unmanured	30	$32\frac{7}{9}$	1,559	28	8	1,340	30	$23\frac{5}{10}$	1,534
4	Thomas' phosphate, 500 lbs. per acre	30	$18\frac{1}{9}$	1,810	30	20	1,330	30	$18\frac{3}{10}$	1,7[illegible]2
5	Thomas' phosphate, 500 lbs., nitrate of soda, 200 lbs. per acre	48	$5\frac{7}{9}$	2,771	48	18	2,190	48	7	2,713
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	43	$31\frac{3}{9}$	2,661	47	12	2,190	44	9	2,614
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	44	$12\frac{3}{9}$	3,248	49	24	2,260	44	$30\frac{5}{10}$	3,149
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	40	$11\frac{5}{9}$	2,376	35	10	1,610	39	$28\frac{5}{10}$	2,299
9	Mineral superphosphate, No. 1, 500 lbs. per acre	35	$12\frac{7}{9}$	2,021	31	26	1,280	35	$\frac{5}{10}$	1,947
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	45	$28\frac{3}{9}$	2,888	47	22	2,130	46	1	2,812
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	36	$1\frac{5}{9}$	2,466	37	2	1,920	36	$5\frac{1}{10}$	2,411
12	Unmanured	22	$4\frac{2}{9}$	1,596	15	.	1,140	21	14	1,550
13	Bone, finely ground, 500 lbs. per acre	33	$11\frac{3}{9}$	2,008	30	10	1,620	33	1	1,969
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	37	$25\frac{8}{9}$	2,263	32	2	1,490	37	$6\frac{5}{10}$	2,186
15	Nitrate of soda, 200 lbs. per acre	45	$23\frac{8}{9}$	2,738	45	30	2,050	45	$24\frac{5}{10}$	2,669
16	Muriate of potash, 150 lbs. per acre	35	$22\frac{2}{9}$	2,256	25	10	1,150	34	21	2,145
17	Sulphate of ammonia, 300 lbs. per acre	43	$17\frac{4}{9}$	3,118	45	10	2,210	43	$23\frac{5}{10}$	3,027
18	Sulphate of iron, 60 lbs. per acre	36	$24\frac{3}{9}$	2,224	30	..	1,180	36	$1\frac{5}{10}$	2,120
19	Common salt (Sodium chloride) 300 lbs. per acre	35	$24\frac{4}{9}$	2,056	33	28	1,260	35	18	1,976
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	33	$6\frac{8}{9}$	2,123	28	8	1,130	32	24	2,024
21	Mineral superphosphate, No. 2, 500 lbs. per acre	33	$5\frac{2}{9}$	1,939	32	32	1,260	33	$4\frac{5}{10}$	1,871

In 1898, the crops from plots 1, 2 and 6 on which barn-yard manure was used were all considerably above the average. This year plot 1, on which rotted manure was used, has given 30 pounds of oats more per acre than that of plot 2 where the manure was applied in a fresh condition. The crop of plot 2 has, however, during the ten years' test given an average of 6 bushels 3 pounds per acre more than plot 1. Of the

other plots, treated with chemical fertilizers, all have fallen much short of the results obtained from barn-yard manure. Seven of them have given returns a little above the average, while 11 have fallen below the average of past years.

CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be as far as is practicable in the late milk, or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the Dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888, 1889 and 1890. In 1891 the Red Cob Ensilage was used, and in 1892, 1893, 1894, 1895, 1896, 1897 and 1898 a free growing Flint variety, the Rural Thoroughbred White Flint, was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888, 1889 and 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892, 1893 and 1894, and the Mammoth Eight Rowed Flint in 1895, 1896, 1897 and 1898. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way and 4 or 5 kernels in a hill. During the past seven years both sorts have been grown in hills. The corn in both series of plots was planted in 1898 on 16th May, and cut 15th September. In most instances the yield of fodder on these plots during the past season has been below the average of past years.

With Indian corn the rotted manure has given in both plots a slightly larger return this year than the fresh manure, but the average of ten years' tests still shows the fresh manure in advance of the rotted in plot 1 by 1 ton 484 pounds per acre, while in plot 2 the advantage is with the rotted manure by 1,911 pounds per acre.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, $\frac{1}{10}$TH ACRE EACH, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Ten Years.				11th Season, 1898.				Average Yield for Eleven Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder		½ Plot No. 2—Mam. 8 rowed, weight of green fodder		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure, well rotted, 12 tons per acre....	16	299	12	786	15	1,660	11	1,800	16	240	12	696
2	Barn-yard manure, fresh, 12 tons per acre.	17	1,086	11	821	15	1,100	11	430	17	724	11	735
3	Unmanured....	8	306	5	1,583	2	1,000	2	1,220	7	1,278	5	1,004
4	Thomas' phosphate, 800 lbs. per acre......	6	1,843	4	1,890	8	1,820	7	240	7	204	5	285
5	Thomas' phosphate, 800 lbs.; nitrate of soda, 200 lbs. per acre....	10	1,474	8	1,128	12	50	11	1,000	10	1,708	8	1,662
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre; composted together, intimately mixed and allowed to heat for several days before using....	16	866	11	1,114	15	1,360	10	750	16	729	11	899
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre....	15	484	10	1,930	14	520	10	300	15	305	10	1,782

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Ten Years. ½ Plot No. 1—weight of green fodder. Per acre. Tons.	lbs.	Average Yield for Ten Years. ½ Plot No. 2—weight of green fodder. Per acre. Tons	lbs	11th Season, 1898. ½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder. Per acre. Tons.	lbs.	11th Season, 1898. ½ Plot No. 2—Mam. 8 row-ed, weight of green fodder. Per acre. Tons	lbs	Average Yield for Eleven Years. ½ Plot No. 1—weight of green fodder. Per acre. Tons.	lbs.	Average Yield for Eleven Years. ½ Plot No. 2—weight of green fodder. Per acre. Tons	lbs
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	11	1,642	8	1,322	9	300	7	....	11	1,156	8	1,020
9	Mineral superphosphate, No. 1, 500 lbs. per acre	10	1,453	8	215	8	1,890	6	1,830	10	1,129	7	1,997
10	Mineral superphosphate, No. 1, 350 lbs. nitrate of soda, 200 lbs. per acre	13	1,082	10	874	13	340	9	1,160	13	1,014	10	718
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	16	492	12	1,152	14	610	9	1,940	16	139	11	1,769
12	Unmanured	10	1,799	8	1,931	7	140	5	1,540	10	1,103	8	1,350
13	Bone, finely ground, 500 lbs. per acre	11	1,402	9	108	10	140	7	60	11	1,105	8	1,740
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	12	676	8	1,973	10	1,040	9	170	12	345	8	1,990
15	Nitrate of soda, 200 lbs. per acre	12	1,627	9	1,789	10	720	5	1,910	12	1,181	9	1,073
16	Sulphate of ammonia, 300 lbs. per acre	13	471	9	1,802	8	1,950	8	660	12	1,696	9	1,516
17	Mineral superphosphate, No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre	13	263	9	1,358	14	1,460	6	780	13	554	9	760
18	Muriate of potash, 300 lbs. per acre	9	487	6	23	6	1,300	5	1,630	9	15	5	1,987
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash, 200 lbs., substituted each year since); dried blood, 300 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre	11	1,386	7	1,760	11	1,710	8	1,000	11	1,415	7	1,873
20	Wood ashes, unleached, 1,900 lbs. per acre	10	126	7	181	8	1,780	7	980	9	1,913	7	254
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre	13	241	9	31	8	1,190	6	830	12	1,418	8	1,558

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The preparation of the land has been the same for both these roots. It was ploughed in the autumn after the crop is gathered, gang-ploughed deeply in the spring after the barn-yard manure has been spread on plots 1, 2 and 6, and after gang-ploughing the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown: 15 rows of Mammoth Long Red, 6 of Mammoth Long Yellow, and 6 of Golden Intermediate on each plot. In 1891, each plot again had three varieties: 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard, and 6 of Golden Tankard. In 1892, 1893, 1894, 1895, 1896, 1897 and 1898, one variety only was used, namely, the Mammoth Long Red. About 4 pounds of seed have been sown per acre, each year. In 1898 the mangels were sown 5th May, came up 15th May, and were pulled 17th October.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889: 25 rows of Carter's Prize Winner, and 2 rows of Carter's Queen of Swedes, and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown: 6 rows of Lord Derby Swede, 4 of New Giant King, 3 of Imperial Swede, 6 of Champion Swede, 4 of Purple Top Swede, and 4 of East Lothian Swede. In 1892, the Improved Purple Top Swede only was sown, in 1893 and 1894 the Prize Purple Top Swede, in 1895 the Imperial Swede, and in 1896, 1897 and 1898 the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, is prepared in the same manner and the fertilizers are spread on it at the same time as they are for the mangels. It is then allowed to stand until the day before sowing, then gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. In 1898, the turnips were sown 10th May, came up 17th May, and were pulled 18th October. The rotted manure has averaged better results throughout than the fresh manure with the mangels, but the turnips have given better results with the fresh manure.

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS, $\frac{1}{10}$TH ACRE EACH.

Number of Plot.	Fertilizers applied each Year.	Average Yield for Nine Years.				10th Season, 1898. Varieties.				Average Yield for Ten Years.			
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		West Half Plot. Mangels, Mammoth Long Red: Weight of Roots.		East Half Plot. Turnips, Purple Top Swede: Weight of Roots.		Mangels, Weight of Roots.		Turnips, Weight of Roots.	
		Per Acre.		Per Acre.		Per Acre.		Per Acre.		Per Acre.		Per Acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure, well rotted, 20 tons per acre	22	1,953	14	1,700	24	540	17	660	23	212	15	196
2	Barn-yard manure, fresh, 20 tons per acre	22	420	15	784	21	910	15	1,488	22	269	15	854
3	Unmanured	9	525	7	1,026	7	1,410	3	10	9	214	7	124
4	Thomas' phosphate, 1,000 lbs. per ac.	8	1,351	7	1,327	7	850	4	50	8	1,101	7	599
5	Thomas' phosphate, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs per acre	13	1,325	9	367	16	1,930	12	1,060	13	1,986	9	1,036
6	Barn-yard manure, partly rotted and actively fermenting, 12 tons per acre; Thomas' phosphate, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	18	819	13	516	18	1,220	13	500	18	859	13	514
7	Thomas' phosphate, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	10	613	9	389	12	600	9	1,360	10	1,012	9	486
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs., in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	14	834	12	50	14	690	14	100	14	820	12	455
9	Mineral superphosphate, No. 1, 500 lbs. per acre	9	1,014	9	356	8	1,140	6	600	9	827	8	1,780

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Nine Years. Mangels, Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Nine Years. Turnips, Weight of Roots. Per Acre. Tons.	lbs.	10th Season, 1898. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre. Tons.	lbs.	10th Season, 1898. Varieties. East Half Plot. Turnips, PurpleTop Swede: Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Ten Years. Mangels, Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Ten Years. Turnips, Weight of Roots. Per Acre. Tons.	lbs.
10	Nitrate of soda, 300 lbs. per acre....	14	1,127	9	114	17	1,610	11	830	14	1,775	9	586
11	Sulphate of ammonia, 300 lbs. per ac.	11	1,119	10	1,161	13	1,930	13	390	11	1,600	10	1,684
12	Unmanured	7	721	7	400	8	1,590	6	730	7	1,008	7	233
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre	10	796	8	1,069	11	880	7	1,080	10	1,004	8	870
14	Wood ashes, unleached, 2,000 lbs. p. ac	11	494	7	1,972	9	1,780	6	1,350	11	223	7	1,710
15	Common salt (Sodium chloride), 400 lbs. per acre	9	1,839	7	1,093	8	210	6	780	9	1,476	7	862
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per ac.	13	1,265	10	1,418	14	1,910	9	300	13	1,530	10	1,106
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre..	12	1,271	9	957	15	720	7	1,980	12	1,816	9	659
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. p.ac.	12	756	10	1,075	14	830	7	760	12	1,163	10	444
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre.....	14	126	11	1,313	12	10	10	770	13	1,714	11	1,059
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre....................	14	1,134	10	1,098	14	520	7	1,940	14	1,073	10	582
21	Mineral superphosphate, No. 2, 500 lbs. per acre.....................	15	455	10	1,774	13	1,170	9	1,470	15	127	10	1,544

CARROT PLOTS.

Carrots have been sown on alternate halves of the oat plots for the past seven years, for the purpose of cleaning the land from weeds. This work was begun in 1891, and the plots have been sown each year with the variety known as the Improved Short White. In 1898, carrots occupied the west half of the plots. The seed was sown 27th April, came up 15th May, and the roots were pulled 21st October. The crop this year has been comparatively light and all the plots have been below the average in yield.

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$TH ACRE) OF CARROTS (IMPROVED SHORT WHITE), AFTER OATS.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Seven Years. Weight of roots per acre.		8th Season, 1898. Improved Short White. Weight of roots per acre.		Average Yield for Eight Years. Weight of roots per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure, well rotted, 15 tons per acre...........	19	1,749	15	1,820	19	758
2	Barn-yard manure, fresh, 15 tons per acre........	21	20	16	1,700	20	980
3	Unmanured	12	1,401	6	1,820	11	1,953
4	Thomas' phosphate, 500 lbs. per acre.......	12	1,565	8	1,650	12	576
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre	15	551	9	860	14	1,090
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using......	19	99	13	330	18	628
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs,; wood ashes, unleached, 1,000 lbs. per acre	15	1,329	11	1,310	15	327
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	12	920	11	850	12	661
9	Mineral superphosphate, No. 1, 500 lbs. per acre....... ...	9	1,878	4	1,080	9	528
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	12	579	7	1,450	11	1,438
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre..........	15	1,257	12	810	15	451
12	Unmanured	10	577	4	180	9	1,027
13	Bone, finely ground, 500 lbs. per acre......................	11	843	*3	310	10	776
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre..	16	1,233	11	280	15	1,684
15	Nitrate of soda, 200 lbs. per acre.........................	14	1,913	5	1,960	13	1,669
16	Muriate of potash, 150 lbs. per acre........................	16	678	11	1,040	15	1,473
17	Sulphate of ammonia, 300 lbs. per acre............	10	1,931	5	760	10	652
18	Sulphate of iron, 60 lbs. per acre..........................	11	1,788	5	330	11	106
19	Common salt (Sodium chloride), 300 lbs. per acre	13	1,393	8	1,690	13	180
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre.	13	1,355	5	1,920	12	1,426
21	Mineral superphosphate, No. 2, 500 lbs. per acre..........	11	689	6	1,790	10	1,577

* This plot was on a ridge and the soil being sandy, many of the plants were destroyed in 1898 by a wind storm.

POTATO PLOTS.

The alternate halves of the wheat and barley plots which were occupied by carrots and sugar beets in 1891, 1892 and 1893 were planted with potatoes in 1894, 1895, 1896, 1897 and 1898. These were planted in rows 2½ feet apart, with the sets about one foot apart in the rows.

Those grown in 1898 after wheat, were planted 14th May, came up 1st June, and were dug 22nd September. On each of these plots there were nine rows each of Empire State, Early Sunrise and Clarke's No. 1.

Those grown after barley, were planted 12th May, came up 21st May, and were dug 19th September. On these plots there were nine rows each of Vanier, Lee's Favourite and Northern Spy. In the tables following, the yield of each variety for each plot is given, also the crop, in bushels, per acre.

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS ($\frac{1}{20}$TH ACRE) OF POTATOES AFTER WHEAT.

No. of Plot.	Fertilizers applied each Year.	West Half of Plots. Yield of 9 rows Empire State.	Yield of 9 rows Early Sunrise.	Yield of 9 rows Clarke's No. 1.	Total Yield per Acre.	
		Lbs.	Lbs.	Lbs.	Bush.	Lbs.
1	Barn-yard manure (mixed horse and cow manure), well rotted, 12 tons per acre in 1888; 15 tons per acre each year since....	320	290	268	292	40
2	Barn-yard manure (mixed horse and cow manure), fresh, 12 tons per acre in 1888; 15 tons per acre each year since..........	281	278½	228	262	30
3	Unmanured	128½	60½	64½	84	30
4	Thomas' phosphate, 500 lbs. per acre........................	95	58	51	68	..
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre..	106½	77½	68	84	..
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using...........	229	216½	204½	216	40
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	158	118½	109	128	30
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre..	108	122½	106	112	10
9	Mineral superphosphate, No. 1, 500 lbs. per acre..............	117	115	91½	107	50
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	105	108½	83½	99	10
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.......	171½	184	157½	171	..
12	Unmanured	66½	53½	42	54	..
13	Bone, finely ground, 500 lbs. per acre.................. ...	90½	74	58½	74	20
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	184½	178½	109	157	20
15	Nitrate of soda, 200 lbs. per acre.......	128	105½	125	119	30
16	Muriate of potash, 150 lbs. per acre	138	117	130	128	20
17	Sulphate of ammonia, 300 lbs. per acre	101½	71	63½	78	40
18	Sulphate of iron, 60 lbs. per acre................	91½	58	58	69	10
19	Common salt (Sodium chloride), 300 lbs. per acre......	65	51	44	53	20
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre..	97	69½	51	72	30
21	Unmanured in 1889; mineral superphosphate, No. 2, 500 lbs. per acre each year since..................................	94½	86½	74	85	..

EXPERIMENTS WITH FERTILIZERS ON HALF PLOTS (1/20TH ACRE) OF POTATOES AFTER BARLEY.

No. of Plot.	Fertilizers applied each Year.	East Half of Plots. Yield of 9 rows Vanier.	Yield of 9 rows Lee's Favourite.	Yield of 9 rows Northern Spy.	Total Yield per Acre.	
		Lbs.	Lbs.	Lbs.	Bush.	lbs.
1	Barn-yard manure, well rotted, 15 tons per acre	169	218½	264	217	10
2	Barn-yard manure, fresh, 15 tons per acre	261½	200	238½	233	20
3	Unmanured	113½	73	119	101	50
4	Thomas' phosphate, 500 lbs. per acre	124½	56½	110	97	
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre	118	60½	89	89	10
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using	213½	150½	199	189	20
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	187	105	134½	142	10
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	181½	105½	121½	136	10
9	Mineral superphosphate, No. 1, 500 lbs. per acre	164½	131	120½	138	40
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	108	98½	70	92	10
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	226	136	188	183	20
12	Unmanured	111	88	51½	80	10
13	Bone, finely ground, 500 lbs. per acre	73	60	45½	59	30
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	172	97½	144	137	50
15	Nitrate of soda, 200 lbs. per acre	83½	63½	84½	77	10
16	Muriate of potash, 150 lbs. per acre	155	80½	85½	107	
17	Sulphate of ammonia, 300 lbs. per acre	49	42	46	45	40
18	Sulphate of iron, 60 lbs. per acre	93	72½	55½	73	40
19	Common salt (Sodium chloride), 300 lbs. per acre	133	91	89	104	20
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre	102½	119½	148½	123	30
21	Mineral superphosphate, No. 2, 500 lbs. per acre	162	88	104½	114	50

In the following table particulars are given of the crops of potatoes obtained each year from 1894 to 1898, inclusive, from each of the plots devoted to experiments with fertilizers, also the average results of these tests for five years. It will be seen that plot 1, to which well rotted barn-yard manure has been applied, has given the best average results in the plots after barley, while in those after wheat plot 2 on which fresh manure was used, has the advantage. None of the artificial fertilizers or mixtures of these fertilizers have given results as good as those obtained from barn-yard manure. Of the single fertilizers tried, the best crops have been had from the mineral superphosphate of lime, and the next best from muriate of potash.

TABLE showing Crops of Potatoes obtained during five years from Fertilized Plots.

No. of Plot.	1894.		1895.		1896.		1897.		1898.		Average for Five Years.	
	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.	After Wheat.	After Barley.
	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.	Bus. lbs.
1	264 50	247 20	306 20	241 40	302 50	253 50	244 10	292 ..	292 40	217 10	282 10	250 24
2	234 20	265 40	366 ..	249 50	270 10	233 40	248 30	261 20	262 30	233 20	296 18	248 46
3	141 10	123 50	144 40	101 30	90 ..	99 50	102 20	123 30	84 30	101 50	112 32	110 6
4	142 50	128 10	127 50	93 40	84 40	98 10	96 50	103 50	68 ..	97 ..	104 2	104 10
5	150 ..	104 40	157 40	98 30	94 ..	98 50	113 30	105 30	84 ..	89 10	119 50	99 20
6	218 10	180 10	317 20	213 50	256 20	196 40	215 50	214 40	216 40	189 20	244 52	204 56
7	172 ..	156 30	213 ..	151 20	165 ..	135 20	163 50	158 50	128 30	142 10	168 28	148 50
8	155 50	162 30	174 20	150 40	133 50	128 20	127 30	163 31	112 10	136 10	140 44	148 14
9	178 50	197 10	169 10	152 10	130 ..	147 40	104 30	156 30	107 50	138 40	138 4	158 26
10	174 50	172 50	169 30	123 40	119 50	99 50	145 20	172 30	99 10	92 10	141 44	132 12
11	175 20	232 40	274 30	163 ..	182 30	193 30	209 50	181 20	171 ..	183 20	202 36	190 46
12	102 30	118 30	119 50	71 20	77 40	80 ..	98 40	95 10	54 ..	80 10	90 32	89 2
13	109 10	97 50	102 50	82 30	85 50	64 ..	108 50	116 10	74 20	59 30	96 12	84 ..
14	180 40	172 ..	204 20	181 20	176 ..	115 ..	150 30	196 10	157 20	137 50	173 46	160 28
15	174 ..	114 40	99 50	81 20	105 30	88 50	111 10	101 ..	119 30	77 10	122 ..	92 36
16	146 20	141 40	148 ..	133 ..	131 40	119 10	128 40	122 50	128 20	107 ..	136 36	124 44
17	98 50	93 10	95 50	94 ..	69 50	54 50	81 50	111 20	78 40	45 40	85 ..	79 48
18	89 40	97 40	103 20	97 10	69 10	71 50	105 ..	129 40	69 10	73 40	87 16	94 ..
19	64 10	156 ..	73 ..	59 ..	52 50	109 ..	101 ..	105 50	53 20	104 20	68 52	106 50
20	85 ..	171 10	60 40	49 40	83 10	107 ..	112 50	136 50	72 30	123 20	82 50	117 36
21	105 ..	155 10	90 20	119 10	95 50	119 16	118 50	154 40	85 ..	114 50	99 ..	132 36

The varieties which have been tested during the five years named and the weights obtained of each sort in pounds per row are here given. These rows have in each case run through the whole series of fertilized and check plots, and as the conditions under which the different varieties have been grown may be considered as very similar, if not identical, the results may fairly be regarded as indicating the relative productiveness of the different sorts under trial.

Name of Variety.	1894.	1895.	1896.	1897.	1898.	Average.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Northern Spy				434	279	356
Queen of the Valley		462	358			410
Vanier				387	333	360
Early Sunrise		407	367	321	277	343
Thorburn	357	329	351			346
Wonder of the World	406	344	247			332
Empire State				328	320	324
Beauty of Hebron	406	257	308			323
Daisy		376	268			322
Early Rose	235	426	294			318
Clarke's No. 1				317	243	280
Lee's Favourite	333	284	295	247	239	280
Burpee's Extra Early			276			276
May Queen Early		269	259			264

DISTRIBUTION OF SEED GRAIN.

Another distribution of seed grain was made in the spring of 1898, consisting mainly of samples of the most promising varieties which were grown at the several experimental farms. These were sent to farmers on application one sample only to each applicant. The object of this distribution was to place within reach of farmers for the improvement of seed, pure samples and true to name of the best and most productive sorts in cultivation. By the careful handling of these samples any farmer can soon obtain sufficient seed for a large area and may thus be provided with the best sorts of grain without any cost beyond that of his own labour. That this part of the farm work is appreciated by farmers throughout the Dominion is shown by the very large demand each year for samples.

Preparations have been made for another distribution in 1899 which will consist as heretofore of the most promising sorts of oats, barley, wheat, pease, Indian corn and potatoes. The several branch farms will also again distribute samples to farmers residing in the provinces and territories where these farms have been established.

The samples sent out from the Central Experimental Farm at Ottawa during the early months of 1897 were distributed as follows :—

Kind of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	426	932	1,235	3,858	2,471	741	492	96
Barley	135	396	282	980	589	217	138	24
Wheat	292	674	1,165	2,801	1,019	489	302	50
Pease	52	361	395	1,181	695	238	153	59
Indian corn	53	159	208	983	724	75	34	25
Potatoes	169	659	503	2,580	2,085	372	219	93
Total number of samples sent.	1,127	3,181	3,788	12,383	7,583	2,132	1,338	347

Total number of samples distributed, 31,879.
Number of applicants supplied, 31,825.

The following list shows the number of three-pound packages of the different varieties which have been sent out :—

OATS.	
Banner	1,889
Abundance	1,707
Improved Ligowo	1,544
Wallis	1,199
Golden Beauty	784
Bavarian	678
Golden Giant	622
American Beauty	327
Early Gothland	326
Siberian O.A.C.	269
White Schonen	235
Joanette	195
Holstein Prolific	174
Mennonite	163
Flying Scotchman	150
Early Archangel	91
Rosedale	54
Columbus	2
Total	10,409

BARLEY, SIX-ROWED.	
Odessa	1,046
Royal	313
Oderbruch	261
Mensury	234
Trooper	60
Success	58
Champion	11
TWO-ROWED.	
Canadian Thorpe	348
French Chevalier	319
Sidney	52
Beaver	37
Total	2,739

LIST of the number of three-pound packages of the different varieties sent out—*Concluded.*

Pease.		Indian Corn.	
Canadian Beauty	1,247	Angel of Midnight	892
Prussian Blue	410	Champion White Pearl	395
Large White Marrowfat	369	Longfellow	244
Mummy	367	Mammoth Eight-rowed Flint	157
Creeper	277	Selected Leaming	218
French Canner	134	White Cap Yellow Dent	98
Arthur	133	King of the Earliest	88
Agnes	82	Mitchell's Extra Early	45
Macoun	58	Compton's Early	40
New Potter	20	Pearce's Prolific	27
Golden Vine	9	Thoroughbred White Flint	15
Total	3,106	Total	2,219
Wheat.		Potatoes.	
		Northern Spy	1,208
Red Fife	2,083	Wonder of the World	940
Preston	1,054	Empire State	917
White Fife	803	Vanier	591
Wellman's Fife	541	May Queen Early	413
Percy	471	Clarke's No. 1	365
Red Fern	351	Lee's Favourite	327
White Russian	269	Early Rose	301
Monarch	268	Early Sunrise	225
White Connell	254	I.X.L.	182
Dion's	250	Carman No. 1	181
Emporium	187	American Wonder	163
Stanley	142	Burpee's Extra Early	152
Crown	121	Burnaby Seedling	140
		Late Puritan	127
Total	6,794	Everett	121
		Early Harvest	95
		Rochester Rose	84
		Daisy	80
		Total	6,612

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples of three pounds each were also distributed from the branch experimental farms as follows :—

Experimental Farm, Nappan, N. S.

Oats	232
Barley	122
Wheat	137
Pease	93
Buckwheat	13
Rye	4
Potatoes	385
	986
No. of applicants supplied	533

Experimental Farm, Indian Head, N.W.T.

Oats	332
Barley	182
Wheat	177
Pease	205
Flax	10
Rye	11
Potatoes	381
	1,298

Experimental Farm, Brandon, Man.

Grain of all sorts	361
Potatoes	129
	490

Experimental Farm, Agassiz, B.C.

Oats	61
Barley	29
Wheat	43
Pease	47
Potatoes	137
	317

These samples added to the number distributed by the Central Experimental Farm make a total of 34,970. This distribution has awakened much interest among farmers regarding the choice of better varieties for seed, and many of the more productive sorts are by this means fast finding their way into general cultivation.

TESTS OF THE VITALITY OF GRAIN AND OTHER SEEDS FOR 1898.

The number of samples of seed grain and other seeds which were tested during the season of 1898 to ascertain the proportion which would germinate was 1,834. The following figures show the variations in the average vitality of the more important cereals during the past six years.

	1893.	1894.	1895.	1896.	1897.	1898.	Average for the Six Years.
Wheat	81·8	90·5	88	87·7	83·5	86·4	86·3
Barley	84·9	89	85·7	90·1	90	91·3	88·5
Oats	93	95·5	93·3	89·8	93·6	92·4	92·9

Many of the samples sent for test are much below the average in vitality and on this account the figures given do not fairly represent the vitality of grain of average quality grown in different parts of the Dominion. The chief object in continuing these tests from year to year is to give farmers the opportunity of having any samples which may be of doubtful vitality, through injury during harvesting or storing, thoroughly tested so that their value for seed purposes may be known. Samples may be sent free through the mail,—the quantity of grain sent should not be less than one ounce,—and this work is done and reported on free of charge. The vitality of samples can usually be ascertained within a fortnight after they are received.

RESULTS of Tests of Seeds for Vitality, 1897-98.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	520	100·0	0·0	81·3	5·1	86·4
Barley	334	100 0	59·0	83·0	8·3	91·3
Oats	453	100·0	17·0	87·8	4·6	92·4
Rye	1	84·0	84·0	76·0	8·0	84·0
Pease	194	100·0	4·0	....	....	86·9
Corn	18	92·0	28·0	....	....	55·5
Grass	13	98·0	26·0	....	....	74·0
Clover	11	79 0	10·0	....	....	63·2
Turnips	22	100·0	35·0	....	....	73·8
Mangels	8	98·0	38·0	....	....	76·0
Carrots	12	74·0	12·0	....	....	51·2
Cabbage	23	99·0	34·0	....	....	63 8
Tomatoes	20	90·0	24·0	....	....	55·9
Millet	3	77 0	5·0	....	....	38·6
Radish	10	78·0	19·0	....	....	55·6
Lettuce	13	96·0	16·0	....	....	68·1
Spinach	7	43·0	18 0	....	....	29·4
Onions	19	77·0	21·0	....	....	50·7
Beet	17	94·0	54·0	....	....	81·6
Celery	9	75·0	15·0	....	....	40·5
Beans	2	100·0	96·0	....	....	98·0
Salsify	2	34·0	33·0	....	....	33·5
Cauliflower	9	89·0	21·0	....	....	63·5
Brussels Sprouts	3	70·0	19·0	....	....	50·6
Borecole	2	84·0	67·0	....	....	75·5
Cress	3	90·0	1·0	....	....	58·0
Tobacco	4	74·0	14·0	....	....	48·5
Pepper	9	31·0	1·0	....	....	13·5
Parsnips	3	15·0	0·0	....	....	6·3
Parsley	3	74·0	19·0	....	....	44·3
Cucumber	4	56·0	24·0	....	....	34·0
Squash	13	90·0	10·0	....	....	49·2
Pumpkin	4	70·0	0·0	....	....	40·0
Water Melon	10	80·0	20·0	....	....	49·0
Musk Melon	11	90·0	10·0	....	....	60·0
Citron	2	50·0	40·0	....	....	45·0
Sweet Peas	10	100·0	48·0	....	....	77·6
Nasturtiums	2	65·0	60·0	....	....	62·5
Mignonette	2	51·0	21·0	....	....	36·0
Flax Seed	3	81·0	48·0	....	....	68·3
Buckwheat	2	92·0	82·0	....	....	87·0
Sunflower	2	100·0	98·0	....	....	99·0
Tares	1	94·0	94·0	....	....	94·0
Canary Seed	1	47·0	47·0	....	....	47·0
Manitoba Maple	1	0·0	0·0	....	....	0·0
Caraway Seed	1	46·0	46·0	....	....	46·0
Asparagus	1	31·0	31·0	....	....	31·0
Chicory	1	73·0	73·0	....	....	73·0
Egg Plant	1	56·0	56·0	....	....	56·0
Rhubarb	1	90·0	90·0	....	....	90·0
Sage	2	28·0	25·0	....	....	26·5
Sweet Marjoram	2	29·0	11·0	....	....	20·0
Saffron	1	28·0	28·0	....	....	28·0
Summer Savory	1	26·0	26·0	....	....	26·0
Sweet Basil	1	58·0	58·0	....	....	58·0
Balm	1	1·0	1·0	....	....	1·0
Rice	1	37·0	37·0	....	....	37·0
Lavender	1	27·0	27·0	....	....	27·0
Horehound	1	36·0	36 0	....	....	36·0
Fennel	1	35·0	35·0	....	....	35·0
Chervil	1	8·0	8·0	....	....	8·0
Mustard	1	88·0	88·0	....	....	88·0
Total number of samples tested, highest and lowest percentage.	1,834	100·0	00·0	....	....	....

TABLE showing Results of Grain Tests for each Province.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	204	100·0	0·0	73·1	7·1	80·2
Barley	144	100·0	72·0	79·3	10·1	89·4
Oats	258	100·0	53·0	90·8	3·1	93·9
QUEBEC.						
Wheat	56	100·0	61·0	87·0	4·2	91·2
Barley	22	97·0	68·0	78·1	10·8	88·9
Oats	14	99·0	37·0	74·4	7·5	81·9
MANITOBA.						
Wheat	65	100·0	62·0	90·4	3·1	93·5
Barley	45	100·0	69·0	90·7	5·3	96·0
Oats	60	100·0	17·0	88·6	5·7	94·3
NORTH-WEST TERRITORIES.						
Wheat	71	100·0	63·0	79·0	5·5	84·5
Barley	53	99·0	79·0	88·4	4·1	92·5
Oats	85	98·0	39·0	80·8	7·5	88·3
NOVA SCOTIA.						
Wheat	59	100·0	62·0	88·0	3·4	91·4
Barley	37	100·0	65·0	80·5	10·6	91·1
Oats	9	100·0	81·0	90·1	4·7	94·8
NEW BRUNSWICK.						
Wheat	35	100·0	67·0	88·7	3·3	92·0
Barley	15	100·0	59·0	82·0	7·7	89·7
Oats	10	100·0	88·0	86·7	7·2	93·9
PRINCE EDWARD ISLAND.						
Wheat	22	100·0	62·0	88·4	3·3	91·7
Barley	11	100·0	67·0	87·7	6·8	94·5
Oats	10	100·0	94·0	93·1	3·5	96·6
BRITISH COLUMBIA.						
Wheat	8	100·0	89·0	96·0	0·7	96·7
Barley	7	100·0	92·0	91·3	6·3	97·6
Oats	7	92·0	68·0	77·4	6·0	83·4

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1898; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall and snowfall.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Number of days' Precipitation.	Heaviest in 24 Hours.	Date.
	°	°	°	°	°		°		In.	In.		In.	
January	20·49	0·67	19·89	9·91	38·9	8th	—24·6	30th	0·66	38·00	19	0·80	24th
February	26·82	11·09	15·73	18·95	43·0	11th	—20·5	2nd	0·90	34·25	18	12·00	21st
March	42·36	24·91	17·45	33·64	57·0	26th	— 1·2	1st	2·13	s	11	0·56	13th
April	54·92	31·83	23·09	43·37	71·0	13th	10·7	4th	0·55	2·00	9	0·33	20th
May	67·74	46·75	20·98	57·24	82·8	31st	32·9	6th	2·45	......	14	0·67	22nd
June	76·79	55·62	21·17	66·20	86·9	30th	45·1	15th	2·06	......	13	0·82	12th
July	82·96	58·22	24·73	70·59	95·0	3rd	41·0	10th	2·87	.....	12	0·78	18th
August	77·52	57·52	20·00	67·52	85·0	11th	42·6	28th	3·22	.....	16	0·80	25th
September	72·14	49·77	22·37	60·95	89·0	4th	33·2	21st	3·46	......	19	1·02	23rd
October	54·09	39·19	14·90	46·64	77·1	2nd	26·0	28th	5·68	s	15	1·12	22nd
November	40·05	25·23	14 82	32·64	60·0	5th	6·5	12th	0·36	10·75	15	0·40	10th
December	26·00	9·23	16·77	17·61	40·7	23rd	—23·3	14th	0·41	27·25	22	1·10	5th
									24·75	112·25	183		

Rain or snow fell on 183 days during the 12 months.
Heaviest rainfall in 24 hours, 1·12 inches on October 22nd.
Heaviest snowfall in 24 hours, 12·00 inches on February 21st.
It will be seen the highest temperature during the 12 months was 95°·0 on July 3rd.
The lowest temperature during the 12 months was—24°6 on January 30th.
During the growing season rain fell on 9 days in April, 14 days in May, 13 days in June, 12 days in July and 16 days in August.
April shows the lowest number of days on which rain fell, viz., 9.
Rain or snow fell on 22 days during December.
Total precipitation during the 12 months 37·17 inches, as compared with 33·08 inches during 1897.

WILLIAM T. ELLIS, *Observer.*

RECORD OF SUNSHINE AT CENTRAL EXPERIMENTAL FARM, OTTAWA, 1898.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
January	21	10	97·4	3·14
February	15	13	67·5	2·41
March	26	5	171·5	5·53
April	29	1	233·8	7·79
May	30	1	186·3	6·01
June	29	1	184·9	6·16
July	30	1	272·8	8 80
August	Instrument	out of order.		
September	27	3	166·9	5·23
October	21	10	106·0	3·41
November	21	9	91·3	3·04
December	15	16	54·3	1·75

WILLIAM T. ELLIS, *Observer.*

LIVE STOCK

AT THE

CENTRAL EXPERIMENTAL FARM.

The live stock at the Central Experimental Farm consists of the following animals:

HORSES.

Of these there are fourteen in all, eight of which form the four working teams of the farm. Of the other horses two are used principally as drivers and the other four for miscellaneous work, including omnibus service. This vehicle which carries the mails, also passengers to the city, makes three trips each day, which requires the services of three horses in order to provide for the necessary changes in the team from day to day. Most of these horses have now been in use for about eleven years, and hence have reached an age when they cannot be expected to render profitable service much longer. It is expected that they will gradually be replaced with younger animals as soon as they begin to fail to do useful and satisfactory work. No horses are now kept for breeding purposes.

CATTLE.

The cattle comprises in all thirty-eight animals, four of which are bulls, twenty-two cows, five heifers and seven heifer calves. There are also thirty-two steers which were bought in the autumn from farmers in the neighbourhood of Ottawa for the purpose of carrying on feeding tests, with different sorts and combinations of fodders, grain and other concentrated food products, to gain information as to the most economical methods to follow in the feeding of steers. These will be sold for beef in the spring.

Part of the milk from the cows is sold to the residents on the farm and the remainder delivered to the dairy where it is made into butter and disposed of at market prices; the skim-milk being used for calves and pigs. The bulls are kept partly for their use on the farm and are available also to farmers at very moderate charges for the improvement of stock.

The cattle may be grouped as follows:—

Guernseys—1 bull, 4 years.
1 heifer calf.
Ayrshires —1 bull, 1½ years.
1 heifer, 3 years.
Jerseys — 1 bull, 1½ years.
2 heifers, 3 and 2 years.
Shorthorns—1 bull, 3 years.
Canadians—6 cows, varying in age from 3 to 11 years.
1 heifer calf.
Grades —16 cows of different ages from 3 to 12 years.
2 heifers, 2 years.
5 heifer calves.

In October, 1898, these animals were again tested with tuberculine and all were found to be quite free from disease.

SWINE.

The following is a summary of the pigs in stock on 30th November, 1898:—

Yorkshires—1 boar, 2 years.
1 sow, 3 "
1 " 5 months.

Berkshires—1 boar, 2½ years.
1 sow, 3 "
1 " 6 months.

Tamworths—1 boar, 1 year.
1 sow, 3 years.
1 " 2 "
1 " 6 months.

Poland Chinas—1 boar, 3 years.
1 sow, 3 "
1 " 6 months.

Chester Whites—1 boar, 2 years.
1 sow, 3 "

Grades—8 pigs, 6 months.
13 " 4 "

POULTRY.

The total number of birds on hand in the poultry houses was 240, and consisted of the following:—14 cocks, 18 cockerels, 149 hens, 52 pullets, 2 drakes, 4 ducks and 1 gander.

The following are the breeds represented and the number of each:—

White Leghorns—2 cocks, 3 cockerels, 24 hens, 8 pullets.
Black Minorcas—3 cocks, 4 cockerels, 7 hens, 8 pullets.
White Minorcas—1 cock, 2 hens, 7 pullets.
Andalusians—1 cock, 2 cockerels, 10 hens.
Brown Leghorns—1 cock, 8 hens.
Light Brahmas—1 cock, 7 hens.
Langshans—3 cockerels, 8 hens, 8 pullets.
Silver-laced Wyandottes—9 hens.
White Wyandottes—10 hens.
Barred Plymouth Rocks—3 cocks, 3 cockerels, 21 hens, 8 pullets.
White Plymouth Rocks—1 cock, 3 cockerels, 8 hens, 8 pullets.
Coloured Dorkings—1 cock, 7 hens.
Cross-breds—28 hens.
Pekin Ducks—1 drake, 3 ducks.
Aylesbury Ducks—1 drake, 1 duck.
1 Wild Goose, male.

APIARY.

In the apiary there are 55 colonies of bees.

EXPERIMENTS IN THE FEEDING OF STEERS, 1897-98.

Twenty-two steers, divided into 11 groups of two each, have been fed with different kinds of fodder mixtures and feeds at the Central Experimental Farm during the past year. The feeding period was divided into four equal portions of four weeks each, making sixteen weeks in all. The bulky fodder rations have been varied, but the particulars of their combination will be found at the head of each group. The meal referred to in the tables has been made of equal parts by weight of pease, barley and oats. In

estimating the cost of the rations, the mixed meal has been valued at the uniform rate of one cent per pound, corn ensilage at $2 per ton, roots $2 per ton, hay at $8 per ton, and straw at $4 per ton. Bran has been valued at $10 per ton, and ground oil-cake and cotton seed meal each at $25 per ton. The price of these products will vary in different localities and in different seasons, but the figures given are about the cost of production or purchase at Ottawa and will afford a basis of comparison for other parts of the Dominion.

In the feeding of farm animals with combinations of fodders and grain, it is desirable to know how far such rations conform to the standard known as a *balanced ration* in each case. In estimating the food value of a ration it is considered mainly from the relative proportions it contains:

1st. Of protein or nitrogenous matter, the function of which is to build up, to supply the nitrogen compounds required for satisfactory growth and at the same time furnish material for repairing and keeping in healthy action the working machinery of the body, and, in the case of milch cows, to provide for an ample secretion of milk.

2nd. Of carbo-hydrates and fat. These, although quite distinct in their character, are conveniently grouped together when considering their feeding value. The carbohydrates consist of such materials as starch, sugar and gum, together with fibre, the woody portions of the plant. These form the largest part of vegetable foods and when digested are either converted into fat or used to produce heat and energy in the body. Fat taken into the animal economy serves a similar purpose to that of the carbohydrates, but is more effectual, one part of fat being equal to 2¼ parts of carbohydrates.

In estimating the value of a ration for any particular class of animals, the proportion of protein it contains is compared with the carbo-hydrates and fat added; the amount of fat having, as already stated, been multiplied by 2¼, and the relation which the protein bears to the carbo-hydrates and fat is known as the nutritive ratio, and a food is said to be a balanced ration when it contains the nutritive materials referred to in about the proportions which experience has shown to produce the best results.

A ration with a large proportion of carbo-hydrates and fat as compared to its protein, is said to have a wide nutritive ratio, while one having a relatively small proportion of carbo-hydrates is spoken of as having a narrow nutritive ratio.

With the object of making this matter clear and of enabling those who desire to ascertain for themselves the nutritive ratio of any foods or combinations of foods they may desire to use, a list is submitted of such coarse fodders, grain and other feeding materials as are commonly used by farmers and stockmen, with the proportions of dry matter in each pound, also the digestible protein, digestible carbo-hydrates and fat, total digestible constituents and nutritive ratio all in adjoining columns. These figures correspond with those given by Prof. W. A. Henry, of Wisconsin, in his recent book on "Feeds and Feeding" which is now generally accepted as a reliable guide on this subject.

Name.	Total Dry Matter in each Lb.	Protein.	Carbo-hydrates + (fat × 2·25).	Total.	Nutritive Ratio.
HAY, STRAW, &C.					
Timothy Hay	·87	·028	·465	·493	1:16·6
Red Clover	·85	·068	·396	·464	1:5·8
Alfalfa	·92	·110	·423	·533	1:3·8
Oat Straw	·91	·012	·404	·416	1:33·6
Wheat Straw	·90	·004	·372	·376	1:93·
Pea Vine Straw	·86	·043	·341	·384	1: 7·9
Corn Fodder	·58	·025	·373	·398	1:14·9
Corn Stover	·60	·017	·340	·357	1:19·9

Fodders, grain, &c., proportion of dry matter in each pound, &c., &c.—*Concluded.*

Name.	Total Dry Matter in each Lb.	Protein.	Carbo-hydrates + (fat × 2-25).	Total.	Nutritive Ratio.
GRAIN.					
Oats	·89	·092	·568	·660	1:6·2
Barley	·89	·087	·692	·779	1:7·9
Wheat	·90	·102	·730	·832	1:7·2
Pease	·90	·168	·534	·702	1:3·2
Corn	·89	·079	·764	·843	1:9·7
Rye	·88	·099	·700	·799	1:7·1
Buckwheat	·87	·077	·533	·610	1:6·9
MILL PRODUCTS.					
Wheat Bran	·88	·122	·453	·575	1:3·7
" Middlings	·88	·128	·607	·735	1:4·7
Buckwheat Bran	·90	·074	·347	·421	1:4·7
Buckwheat Middlings	·87	·220	·456	·676	1:2·1
BYE PRODUCTS.					
Malt Sprouts	·90	·186	·409	·595	1:2·2
Brewers' Grains, wet	·24	·039	·125	·164	1:3·2
" " dry	·92	·157	·478	·635	1:3·
Gluten Meal	·92	·258	·656	·914	1:2·5
Linseed Meal (old process)	·91	·293	·485	·778	1:1·7
" " (new process)	·90	·282	·464	·746	1:1·6
Cotton Seed Meal	·92	·372	·444	·816	1:1·2
Skim-milk	·094	·029	·059	·088	1:2·
Buttermilk	·10	·039	·065	·104	1:1·7
Whey	·066	·008	·054	·062	1:6 7
ROOTS AND ENSILAGE.					
Mangels	·09	·011	·056	·067	1: 5·1
Turnips	·09	·010	·078	.088	1: 1·8
Carrots	·11	·008	·082	·090	1:10·3
Sugar Beets	·13	·011	·104	·115	1: 9·4
Potatoes	·21	·009	·165	·174	1:18·3
Ensilage (Corn)	·21	·009	·129	·138	1:14·3
SOILING FODDER.					
Fodder Corn	·20	·010	·125	·135	1:12·5
Pease and Oats	·16	·018	·076	·094	1:4·2
Pease and Barley	·16	017	·077	·094	1:4·5
Red Clover	·29	·029	·164	·193	1:5·6
Alfalfa	·28	·039	·138	·177	1:3·5

The figures forming the nutritive ratio are obtained by dividing the carbo-hydrates and fat by the protein. As an illustration as to how this table may be used to ascertain the nutritive ratio in any fodder mixture, let us take the bulky fodder ration No. 1 used in the feeding experiments to be presently referred to:

—	Dry Matter.	Protein.	Carbo-hydrates and Fat.	Total.	Nutritive Ratio.
50lbs. Corn ensilage	10·50	·450	6·450	6·900	
25lbs. Roots (mangels)	2·25	·275	1·400	1·675	
5lbs. Clover hay, cut	4·25	·340	1-980	2·320	
5lbs. Oat straw, cut	4·55	·060	2·020	2·080	1:10·5

This ration is rather wide to obtain the best results, but it is easily made narrower by the addition of grain and other concentrated feeds—3 pounds of meal, equal parts of oats, barley and pease with 1 pound of oil-cake or cotton seed meal fed to each animal per day, with an average consumption of 40 pounds of coarse fodder per day, will narrow the ration down to about 1:7·2, whereas the accepted standards for the feeding of young steers range from 1:6 to 1:8.

The amount of dry matter in the food would, however, in this case be short of the quantity said to give the best results, but this could be increased by adding to the quantity of hay consumed, which would again widen the ration somewhat and require a further addition of grain or bran to correct this.

The objects in view in conducting these experiments have been to gain such information as will show how beef can be produced at the smallest cost, how such products as the farmer can easily grow may be used to the best advantage, and what results are had where rations are fed the nutritive ratio of which is wider than is usually recommended.

No strict uniformity in results can be expected even where the same ration is fed: the breeding of the animal, its individual vigour and capacity for digestion, the temperature of the stables, and the quality of the food where ensilage forms any considerable part of it, are all factors which influence the results to a considerable degree, neverthelesss much useful information may be gained by repeated tests of this character which will be helpful to farmers and stockmen.

During the course of these tests the steers were given all the bulky fodder they would eat up clean, they were watered regularly twice a day and supplied with salt in a small box at the side of the manger.

The steers were weighed on the 18th December and again three times at the close of the period of preparatory feeding on the 18th January. The first weights taken and the average of the three last weighings were as follows, the weights being given in the order in which the animals were finally grouped:—

WEIGHT OF STEERS.

	Dec. 18, 1897.	Jan. 18, 1898.
	Lbs.	Lbs.
Group No. 1—		
No. 1	810	840
No. 2	810	870
	1,620	1,710
Group No. 2—		
No. 3	875	940
No. 4	975	1,015
	1,850	1,955
Group No. 3—		
No. 5	910	990
No. 6	850	940
	1,760	1,930
Group No. 4—		
No. 7	855	905
No. 8	790	830
	1,645	1,735
Group No. 5—		
No. 9	800	890
No. 10	800	815
	1,600	1,705
Group No. 6—		
No. 11	890	980
No. 12	865	965
	1,755	1,945
Group No. 7—		
No. 13	980	1,065
No. 14	875	840
	1,855	1,905
Group No. 8—		
No. 15	850	935
No. 16	740	820
	1,590	1,755
Group No. 9—		
No. 17	720	760
No. 18	1,050	1,120
	1,770	1,880
Group No. 10—		
No. 19	810	855
No. 20	855	910
	1,665	1,765
Group No. 11—		
No. 21	675	730
No. 22	605	660
	1,280	1,390

The eleven groups of steers referred to in the adjoining tables were fed as follows :—

GROUP No. 1.—TWO STEERS, NOS. 1 AND 2.

Bulky fodder ration No 1.—

Ensilage, 50 lbs..............1st 4 weeks, no meal.
Turnips, 25 lbs.,.............2nd 4 weeks, no meal.
Hay, cut, 5 lbs..............3rd 4 weeks, 2 pounds meal per day.
Straw, cut, 5 lbs,............4th 4 weeks, 6 pounds meal per day.

Nutritive ratio : 1st and 2nd 4 weeks, 1:10·5 ; 3rd 4 weeks, 1:8·9 ; 4th 4 weeks, 1:7·5.

GROUP No. 2.—TWO STEERS, NOS. 3 AND 4.

Bulky fodder ration No 1.—

1st 4 weeks, no meal.
2nd 4 weeks, 1 lb. meal and 1 lb. cotton seed meal per day.
3rd 4 weeks, 2 lbs meal and 2 lbs cotton seed meal per day.
4th 4 weeks, 4 lbs meal and 2 lbs cotton seed meal per day.

Nutrtive ratio : 1st 4 weeks, 1:10·5 ; 2nd 4 weeks, 1:6·6 ; 3rd 4 weeks, 1:5·2 ; 4th 4 weeks, 1:5·2.

GROUP No. 3.—TWO STEERS, NOS. 5 and 6.

Bulky fodder ration No. 2—

Ensilage, 50 lbs................1st 4 weeks, no meal.
Hay, 5 lbs.....................2nd 4 weeks, 2 lbs. meal per day.
Straw, 5 pounds................3rd 4 weeks, 4 lbs. meal per day.
4th 4 weeks, 6 lbs. meal per day.

Nutritive ratio : 1st 4 weeks, 1:12·3 ; 2nd 4 weeks, 1:10·2 ; 3rd 4 weeks, 1:9·1 ; 4th 4 weeks, 1:8·3.

GROUP No. 4.—TWO STEERS, NOS. 7 and 8.

Bulky fodder ration No. 2—

Ensilage, 50 lbs.........1st 4 weeks, no meal.
Hay, 5 lbs...........2nd 4 weeks, 1 lb. meal and 1 lb. oil-cake per day.
Straw, 5 lbs............3rd 4 weeks, 2 lbs. meal and 2 lbs. oil-cake per day,
4th 4 weeks, 4 lbs. meal and 2 lbs. oil-cake per day.

Nutritive ratio : 1st 4 weeks, 1:12·3 ; 2nd 4 weeks, 1:8·2 ; 3rd 4 weeks, 1:6·6 ; 4th 4 weeks, 1:6·4.

GROUP No. 5.—TWO STEERS, NOS. 9 and 10.

Bulky fodder ration No. 1—

Ensilage, 50 lbs...1st 4 weeks, 2 lbs. meal and 2 lbs. bran per day.
Turnips, 25 lbs....2nd 4 weeks, 2 lbs. meal and 2 lbs. bran per day.
Hay, cut, 5 lbs....3rd 4 weeks, 3 lbs. meal and 3 lbs. bran per day.
Straw, cut, 5 lbs..4th 4 weeks, 4 lbs. meal and 4 lbs. bran per day.

Nutritive ratio : 1st and 2nd 4 weeks, 1:7·7 ; 3rd 4 weeks, 1:7·1 ; 4th 4 weeks, 1:6·7.

GROUP NO. 6.—TWO STEERS, NOS. 11 and 12.

Bulky fodder ration No. 1—

Corn ensilage, 50 lbs. 1st 4 weeks, 2 lbs. meal and 2 lbs. bran per day.
Turnips, 25 lbs.,.... 2nd 4 weeks, 1 lb. meal, 1 lb. cotton seed and 2 lbs. bran per day.
Hay, 5 lbs.......... 3rd 4 weeks, $1\frac{1}{2}$ lbs. meal, $1\frac{1}{2}$ lbs. cotton seed and 3 lbs. bran per day.
Straw, 5 lbs......... 4th 4 weeks, 2 lbs. meal, 2 lbs. cotton seed and 4 lbs. bran p. day.

Nutritive ratio: 1st 4 weeks, 1:8·7; 2nd 4 weeks, 1:6·8; 3rd 4 weeks, 1:5·9; 4th 4 weeks, 1:5·3.

GROUP NO. 7.—TWO STEERS, NOS. 13 AND 14.

Bulky fodder ration No 1—

Ensilage, 50 lbs..... 1st 4 weeks, 2 lbs. meal and 2 lbs. bran per day.
Turnips, 25 lbs.... 2nd 4 weeks, 3 lbs. meal and 3 lbs. bran per day.
Hay, cut, 5 lbs.... 3rd 4 weeks, 4 lbs. meal and 4 lbs. bran per day.
Straw, cut, 5 lbs.. 4th 4 weeks, 6 lbs. meal and 4 lbs. bran per day.

Nutritive ratio: 1st 4 weeks, 1:8·7; 2nd 4 weeks, 1:7·9; 3rd 4 weeks, 1:7·3; 4th 4 weeks, 1:7.

GROUP NO. 8.—TWO STEERS, NOS. 15 AND 16.

Bulky fodder ration No. 1—

Ensilage, 50 lbs.... 1st 4 weeks, 2 lbs. meal and 2 lbs. bran per day.
Turnips, 25 lbs.....2nd 4 weeks, 2 lbs. meal 1 lb. cotton seed and 3 lbs. bran per day.
Hay cut, 5 lbs.....3rd 4 weeks, 2 lbs. meal, 2 lbs. cotton seed and 4 lbs. bran per day.
Straw, cut, 5 lbs.....4th 4 weeks, 4 lbs. meal, 2 lbs. cotton seed and 4 lbs. bran per day.

Nutritive ratio: 1st 4 weeks, 1:8·7; 2nd 4 weeks, 1:6·4; 3rd 4 weeks, 1:5·3; 4th 4 weeks, 1:5·3.

GROUP NO. 9.—TWO STEERS, NOS. 17 AND 18.

Bulky fodder ration No. 3—

Timothy hay, 20 lbs...1st 4 weeks, 2 lbs. meal and 1 lb. bran per day.
Turnips, 40 lbs...... 2nd 4 weeks, 1 lb. meal, 1 lb. cotton seed meal and 2 lbs. bran per day.
3rd 4 weeks, $1\frac{1}{2}$ lbs. meal, $1\frac{1}{2}$ lbs. cotton seed meal and 3 lbs. bran per day.
4th 4 weeks, 2 lbs. meal, 2 lbs. cotton seed meal and 4 lbs. bran per day.

Nutritive ratio: 1st 4 weeks, 1:10; 2nd 4 weeks, 1:7·4; 3rd 4 weeks, 1:6·4; 4th 4 weeks, 1:5·8.

GOUP NO. 10.—TWO STEERS, NOS. 19 AND 20.

Bulky fodder ration No. 4—

Brome grass hay, 20 lbs..1st 4 weeks, 2 lbs. meal and 1 lb. bran per day.
Turnips, 40 lbs......... 2nd 4 weeks, 1 lb. meal, 1 lb. cotton seed meal and 2 lbs. bran per day.
3rd 4 weeks, $1\frac{1}{2}$ lbs. meal, $1\frac{1}{2}$ lbs cotton seed meal and 3 lbs. bran per day.
Fed for twelve weeks only.

The Brome grass has so nearly the same nutritive constituents as Timothy that the same figures may be taken: Nutritive ratio 1st 4 weeks, 1:10·; 2nd 4 weeks, 1:7·4; 3rd 4 weeks, 1:6·4.

GROUP No. 11.—TWO STEERS, NOS. 21 AND 22.

Not on test for first half of first 4 weeks.

Bulky fodder ration No. 1.—Ensilage, 50 pounds ; turnips, 25 pounds ; hay, 5 pounds ; straw, 5 pounds.

The last half of first 4 weeks they also received 3 pounds of meal per day, composed of equal parts by weight of pease, barley and oats, all ground. During the remaining 12 weeks each steer received 2 pounds of cornmeal per day, with a gradually increasing quantity of a mixture composed of ¼ ground oil-cake, ¼ cotton seed meal and ½ bran, and a feed of long hay at noon.

Nutritive ratio: 1st 4 weeks, 1:9·8; 2nd 4 weeks, 1:8·2; 3rd 4 weeks, 1:7·2; 4th 4 weeks, 1:6·8.

GROUP No. 1.—TWO STEERS, FED AS FOLLOWS :

Steer.	Fodder consumed per day.	Meal per day.	Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.	$ cts.
1st 4 weeks—							
No. 1	25·75	....	15	0·53	3·18	5 93	
No. 2	29·21	....	....	....	3·60		5 93
Averages	27·21	....	....	....	3·39		
2nd 4 weeks—							
No. 1	25·39	....	35	1·25	3·13	2 50	
No. 2	32·60	....	35	1·25	4·02	3 21	2 85
Averages	28·99	....	35	1·25	3·57		
3rd 4 weeks—							
No. 1	31·21	2	45	1·60	5·85	3 64	
No. 2	36·60	2	55	1·96	6·52	3 31	3 46
Averages	33·90	2	50	1·78	6·18		
4th 4 weeks—							
No. 1..................	34·39	6	77	2·75	10·24	3 72	
No. 2	38·82	6	49	1·75	10·79	6 16	4 67
Averages	36·60	6	63	2·25	10·51		4 22

GROUP NO. 2.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.		Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.		Lbs.	Lbs.	Cts.	$ cts.	$ cts.
1st 4 weeks—								
No. 3	42·28	....		....	....	5·22		
No. 4	39·10	....		·30	1·07	4·83	4 50	
Averages	40·69	....		....	....	5·02		
2nd 4 weeks—		Meal,	C.S.					
No. 3	42·00	1	1	65	2·32	7·43	3 20	
No. 4	38·42	1	1	65	2·32	6·99	3 01	3 10
Averages	40·21	1	1	65	2·32	7·21		
3rd 4 weeks—								
No. 3	42·00	2	2	65	2·32	9·68	4 16	
No. 4	40·00	2	2	35	1·25	9·44	7 55	5·35
Averages	41·00	2	2	50	1 77	9·56		
4th 4 weeks—								
No. 3	43·14	4	2	34	1·21	11·82	9 73	
No. 4	43·07	4	2	87	3·10	11·82	3 80	5·51
Averages	43·10	4	2	60	2·15	11·82		4 61

GROUP NO. 3.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.	Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.	Lbs.	Lbs.	Cts.	$ cts.	$ cts.
1st 4 weeks—							
No. 5	29·64	....	....	....	3·94		
No. 6	28·96	....	10	·35	3·86	10 80	
Averages	29·30	....	....	....	3·9)		
2nd 4 weeks—							
No. 5	38·	2	50	1·78	7·06	3 95	
No. 6	35·42	2	45	1·60	6·72	4 18	4 06
Averages	36·71	2	47·50	1·69	6·89		
3rd 4 weeks							
No. 5	38·60	4	55	1·96	9·14	4 65	
No. 6	37·67	4	50	1·78	9·02	5 05	4 84
Averages	38·13	4	52·50	1·87	9·08		
4th 4 weeks—							
No. 5	43·35	6	62	2·21	11·78	5 32	
No. 6	38·57	6	34	1·21	11·14	9 17	6 68
Averages	40 96	6	48	1·71	11 46		6 59

GROUP No. 4.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.		Total increase in Weight.	Increase in Weight per day.	Cost per day.	ost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.		Lbs.	Lbs.	Cts.	$ cts.	$ cts.
1st 4 weeks—								
No. 7	29·57	....		35	1·25	3·94	3 15	
No. 8	19·32	....		....	....	2·57		
Averages	24·44	....		....	... ...	3·25		
2nd 4 weeks—		Meal.	O.C.					
No. 7	33·50	1	1	60	2·14	6·98	3 25	
No. 8	27·21	1	1	60	2·14	5·87	2 73	2 99
Averages	30·35	1	1	60	2·14	6·42		
3rd 4 weeks—								
No. 7	36·00	2	2	25	·89	9·30	10 41	
No. 8	29·14	2	2	45	1·60	8·38	5 21	7 07
Averages	32·57	2	2	35	1·24	8·84		
4th 4 weeks—								
No. 7	37·67	4	2	52	1·85	11·52	6 20	
No. 8	32·64	4	2	50	1·78	10·85	6 07	6 13
Averages	35·15	4	2	51	1·81	11·18		4 83

GROUP No. 5.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.		Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.		Lbs.	Lbs.	Cts.	$ cts.	$ cts.
1st 4 weeks—		Meal	Bran					
No. 9	28·07	2	2	35	1·25	6·46	5 16	
No. 10	28·03	2	2	20	0·71	6·46	9 04	6 57
Averages	28·05	2	2	27·50	0·98	6·46		
2nd 4 weeks—								
No. 9	32·42	2	2	50	1·78	7·00	3 92	
No. 10	34·39	2	2	55	1·96	7·24	3 68	3 79
Averages	33·40	2	2	52·50	1·87	7·12		
3rd 4 weeks—								
No. 9	36·57	3	3	25	0·89	9·01	10 09	
No. 10	39·64	3	3	20	0·71	9·39	13 14	11 44
Averages	38·10	3	3	22·50	0·80	9·20		
4th 4 weeks—								
No. 9	38·82	4	4	78	2·82	10·91	3 86	
No. 10	39·17	4	4	55	1·96	10·83	5 51	4 54
Averages	39·49	4	4	67	2·39	10·87		6 58

GROUP NO. 6.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.			Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.			Lbs.	Lbs.	Cts.	$ cts.	$ cts.
		Meal.	C.S.	Bran.					
1st 4 weeks—									
No. 11	41·92	2	0	2	40	1·42	8·17	5·71	
No. 12	41·00	2	0	2	60	2·14	8·13	3·79	4·56
Averages	41·76	2	0	2	50	1·78	8·15		
2nd 4 weeks—									
No. 11	42·00	1	1	2	80	2·85	8·43	2·95	
No. 12	42·00	1	1	2	55	1·96	8·43	4·29	3·49
Averages	42·00	1	1	2	67·50	2·40	8·43		
3rd 4 weeks—									
No. 11	42·35	1½	1½	3	85	3·03	10·10	3·32	
No. 12	42·35	1½	1½	3	55	1·96	10·10	5·14	4·04
Averages	42·35	1½	1½	3	70	2·49	10·10		
4th 4 weeks—									
No. 11	43·78	2	2	4	12	0·42	11·90	27·76	
No. 12	43·78	2	2	4	49	1·75	11·90	6 80	10·92
Averages	43·78	2	2	4	30·50	1·08	11·90		5·75

GROUP NO. 7.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.		Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.		Lbs.	Lbs.	Cts.	$ cts.	$ cts.
1st 4 weeks—		Meal	Bran					
No. 13	43·21	2	2	20	0·71	8·33	11 66	
No. 14	21·50	2	2	....	....	5·65		
Averages	32 35	2	2	....	....	6·99		
2nd 4 weeks—								
No. 13	42 00	3	3	90	3·21	9·68	3 01	
No. 14	39·14	3	3	105	3·76	9·33	2 48	2 70
Averages	40·57	3	3	97·50	3·48	9·50		
3rd 4 weeks—								
No. 13	42·35	4	4	20	·71	11·23	15 72	
No. 14	39·82	4	4	75	2·67	10·91	4 07	6 52
Averages	41·08	4	4	47·50	1·69	11·07		
4th 4 weeks—								
No. 13	43·78	6	4	86	3·07	13·40	4 36	
No. 14	42·53	6	4	57	2·03	13·25	6 56	5 24
Averages	43·15	6	4	71·50	2·55	13·32		6 53

GROUP NO. 8.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.			Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.			Lbs.	Lbs.	Cts.	$ cts.	$ cts.
		Meal.	C. S.	Bran					
1st 4 weeks—									
No. 15.................	28·50	2	...	2	40	1·42	6·52	4 56	
No. 16.................	26·71	2	...	2	40	1·42	6·29	4 40	4 48
Averages.........	27·60	2	...	2	40	1·42	6·40		
2nd 4 weeks—									
No. 15.................	34	2	1	3	65	2·32	8·92	3 85	
No. 16.................	28·64	2	1	3	75	2·67	8·28	3 09	3 44
Averages.........	31·32	2	1	3	70	2·49	8·61		
3rd 4 weeks—									
No. 15.................	37·35	2	2	4	40	1·42	11·11	7 77	
No. 16.................	34·32	2	2	4	50	1·78	10·83	6 06	6 82
Averages.........	35·83	2	2	4	45	1·60	10 97		
4th 4 weeks—									
No. 15.................	36·60	4	2	4	44	1·57	13·02	8 28	
No. 16.................	37·85	4	2	4	45	1·60	13·17	8 19	8 23
Averages.........	37·22	4	2	4	44·50	1·58	13·09		5 74

GROUP NO. 9.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.			Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.			Lbs.	Lbs.	Cts.	$ cts.	$ cts.
		Meal.	C. S.	Bran.					
1st 4 weeks—									
No. 17.................	28·00	2	...	1	45	1·60	8·10	5 04	
No. 18.................	38·50	2	...	1	45	1·60	10·20	6 34	5 69
Averages.........	33·25	2	...	1	45	1·60	9 15		
2nd 4 weeks—									
No. 17.................	29·96	1	1	2	35	1·25	9·24	7 39	
No. 18.................	40·00	1	1	2	50	1·78	11·25	6 30	6 74
Averages.........	34·98	1	1	2	42·50	1·51	10·24		
3rd 4 weeks—									
No. 17.................	35·53	1½	1½	3	50	1·78	11·97	6 70	
No. 18.................	38·07	1½	1½	3	35	1·25	12·48	9 98	8 05
Averages.........	36·80	1½	1½	3	42·50	1·51	12·22		
4th 4 weeks—									
No. 17.................	32·78	2	2	4	42	1·50	13·05	8 70	
No. 18.................	37·67	2	2	4	74	2·64	14·03	8 30	6 53
Averages.........	35·22	2	2	4	58	2·07	13·54		6 75

GROUP No. 10.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.	Meal per day.			Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Lbs.			Lbs.	Lbs.	Cts.	$ cts	$ cts.
		Meal.	C. S.	Bran.					
1st 4 weeks—									
No. 19	32·57	2	..	1	55	1·96	9·01	4 58	
No. 20	32·64	2	..	1	45	1·60	9·02	5 61	5 04
Averages	32·60	2	..	1	50	1·78	9·01		
2nd 4 weeks—									
No. 19	32·53	1	1	2	15	·53	9·75	18 20	
No. 20	34·00	1	1	2	55	1·96	10·05	5 12	7 92
Averages	33·26	1	1	2	35	1·24	9·90		
3rd 4 weeks—									
No. 19	35·85	1½	1½	3	50	1·78	12·04	6 74	
No. 20	35·89	1½	1½	3	25	·89	12·04	13 48	8 98
Averages	35·87	1½	1½	3	37·50	1·33	12·04		7 31

GROUP No. 11.—TWO STEERS, FED AS FOLLOWS:

Steer.	Fodder consumed per day.		Meal per day.		Total increase in Weight.	Increase in Weight per day.	Cost per day.	Cost per 100 lbs. of increase.	Average cost per 100 lbs. for Group.
	Lbs.	Hay	Lbs.		Lbs.	Lbs.	Cts.	$ cts.	$ cts.
Last half of 1st 4 weeks—									
No. 21	22·14	3		3	20	1·42	6·93	4 85	
No. 22	22·14	3		3	30	2·14	6·93	3 23	3 88
Averages	22·14	3		3	25	1·78	6·93		
			Corn Meal.	Mix'd Meal.					
2nd 4 weeks—									
No. 21	25·92	3·42	2	2	20	·71	8·30	11 62	
No. 22	25·92	3·42	2	2	60	2·13	8·30	3 87	5 81
Averages	25·92	3·42	2	2	40	1·42	8·30		
3rd 4 weeks—									
No. 21	28·57	4	2	3	80	2·85	9·73	3 40	
No. 22	28·57	4	2	3	40	1·42	9·73	6 81	4 54
Averages	28·57	4	2	3	60	2·13	9·73		
4th 4 weeks—									
No. 21	29·03	4	2	3·50	42	1·50	10·22	6 81	
No. 22	29·03	4	2	3·50	60	2·13	10·22	4 76	5 61
Averages	29·03	4	2	3·50	51	1·81	10·22		4 96

The foregoing experiments show the following results :—

—	Total gain per Steer.	Average cost per day per Steer.	Cost per 100 lbs. of increase per Group.
	Lbs.	Cents.	$ cts.
Group No. 1	155½	5·91	4 22
" 2	188	8·40	4 61
" 3	140½	7·85	6 59
" 4	163½	7·42	4 83
" 5	169½	8·41	6 58
" 6	218	9·65	5 75
" 7	216½	10·22	6 53
" 8	199½	9·77	5 74
" 9	188	11·29	6 75
" 10, fed for twelve weeks only	122½	10·32	7 31
" 11	198½	8·80	4 96

From the above it will be seen that the best results have been had from the rations fed to groups 1, 2, 4 and 11.

EXPERIMENTS IN THE FATTENING OF SWINE.

Experiments in the fattening of swine have been continued during the past year. These experiments have been conducted at intervals since 1890, using different rations from year to year for the purpose of gaining information regarding the best methods of producing pork of the highest quality and at the least cost. Particulars are submitted as to the different sorts of food used, the quantities consumed and the increase in live weight of the animals under test.

THE FEEDING OF SWINE WITH A MIXTURE OF WHOLE GRAIN, DRY.

Lot 24.—This pen contained four cross-bred swine, two Poland China sire, with Tamworth dam, farrowed 7th April, 1898, one Tamworth sire and Chester White dam, farrowed 1st April, 1898, and one Poland China sire and Yorkshire dam, farrowed 31st March, 1898. These were fed entirely on a mixture of equal parts of unground oats, barley and pease and half a part of bran. The food was all used dry, but the swine had all the water they required in a separate trough ; as much food was given them as they would eat up clean. This feeding test was begun on the 20th July, 1898, and continued for fourteen weeks, or until the 26th of October. The pigs were weighed every two weeks, and the increase in weight and the quantity of food consumed during each four weeks are given in the accompaying tables.

No. of Swine, Four.	20th July.	17th August.	14th September	12th October.	26th October.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	270	364	490	656	702	
Increase in weight	....	94	126	166	46	432
Feed consumed	....	330	542	624	270	1,766
" " per lb. of increase	....	3·51	4·30	3·75	5·86	4·08

Nutritive ratio of mixture fed, 1:4·7.

The average live weight of each pig when this feeding test was begun was 67½ pounds; the average weight at the conclusion of the experiment was 175½ pounds.

THE FEEDING OF SWINE WITH A MIXTURE OF WHOLE GRAIN, SOAKED.

Lot 25.—This pen contained four cross-bred swine, two Poland China sire and Tamworth dam, farrowed 7th April, 1898, one Tamworth sire and Chester White dam, farrowed 1st April, 1898, and one Poland China sire and Yorkshire dam, farrowed 31st March, 1898. These were fed for the full period of fourteen weeks on a mixture of equal parts of unground oats, barley and pease, with half a part of bran, all soaked on an average for 30 hours in cold water. They received as much of the mixture as they would eat up clean.

Number of Swine, Four.	20th July.	17th August.	14th September	12th October.	26th October.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	263	357	494	638	685	....
Increase in weight	....	94	137	144	47	422
Feed consumed	....	345	519	566	208	1,638
" per pound of increase	....	3·67	3·78	3·93	4·42	3·88

Nutritive ratio of mixture fed, 1:4·7.

The average live weight of each pig in this group when the test was begun was 65¾ pounds; the average weight at the conclusion of the experiment was 171¼ pounds.

THE FEEDING OF SWINE WITH A MIXTURE OF GROUND GRAIN, DRY.

Lot 26.—This pen contained four cross-bred swine, two Poland China sire and Yorkshire dam, farrowed 31st March, 1898, one Tamworth sire and Chester White dam, farrowed 1st April, 1898, and one Poland China sire and Tamworth dam, farrowed 7th April, 1898. These were fed for the full period of fourteen weeks on a mixture of equal parts of ground oats, barley and pease, with half a part of bran, all fed dry. As much food was given to them as they would eat up clean, and they had all the water they required in a separate trough.

No. of Swine, Four.	20th July.	17th August.	14th September	12th October.	26th October.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	275	400	554	716	780	
Increase in weight	....	125	154	162	64	505
Feed consumed	....	365	550	598	287	1,800
" per pound of increase	....	2·92	3·57	3 69	4·48	3·56

Nutritive ratio of mixture fed, 1:4·7.

The average live weight of each pig in this group when the test was begun was 68¾ pounds; the average weight at the conclusion of the experiment was 195 pounds.

THE FEEDING OF SWINE WITH A MIXTURE OF GROUND GRAIN, SOAKED.

Lot 27.—This pen contained four cross-bred swine, two Poland China sire and Tamworth dam, farrowed 7th April, 1898, one Tamworth sire and Chester White dam, farrowed 1st April, 1898, and one Poland China sire and Yorkshire dam farrowed 31st March, 1898. These were fed for the full period of fourteen weeks on a mixture of

equal parts of ground oats, barley and pease, with half a part of bran, all soaked on an average for 30 hours in cold water. They received as much of the mixture as they would eat up clean.

No. of Swine, Four.	20th July.	17th August.	14th September	12th October.	26th October.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	266	381	524	711	762	
Increase in weight	....	115	143	187	51	496
Feed consumed.	....	411	536	637	283	1,867
" per pound of increase.	....	3·57	3·74	3·40	5·54	3·76

Nutritive ratio of mixture fed, 1:4·7.

The average live weight of each pig in this group when the test was begun was 66½ pounds; the average weight at the conclusion of the experiment was 190½ pounds.

ON THE FEEDING OF SWINE ON A MIXTURE OF GROUND GRAIN, SOAKED, WITH CLOVER ADDED.

Lot 28.—This pen contained four cross-bred swine, one Poland China sire and Tamworth dam farrowed 7th April, 1898, one Tamworth sire and Chester White dam farrowed 1st April, 1898, one Poland China sire and Yorkshire dam farrowed 31st March, 1898, and one Tamworth farrowed 12th April, 1898. These were fed for the full period of fourteen weeks on a mixture of equal parts of ground oats, barley and pease, with half a part of bran, and cut clover added in sufficient quantity to make a mixture of three parts of meal to one part of clover by weight. The mixed meal and clover was soaked on an average for 30 hours in cold water, and the pigs were given as much of the mixture as they would eat up clean.

Number of Swine, Four.	20th July.	17th August.	14th September	12th October.	26th October.	Totals.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Total live weight	273	320	402	500	547	
Increase in weight	....	47	82	98	47	274
Feed consumed, meal	....	201	283½	345	159	988½
" clover	....	67	94½	115	53	329½
" per pound of increase, meal	....	4·27	3·45	3·52	3·38	3·60
" per pound of increase, clover	....	1·42	1·15	1·17	1·12	1·20

Nutritive ratio of mixture fed, 1:4·9.

The average live weight of each pig in this group when the test was begun was 68¼ pounds; the average weight at the conclusion of the experiment was 136¾ pounds.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

NAPPAN, NOVA SCOTIA.

A visit was paid to the Experimental Farm for the Maritime Provinces at Nappan, N. S., during the second week in July. The various branches of work at this farm were making fair progress, and although seeding had been so very late that crops were necessarily backward, they nevertheless looked healthy and vigorous and promised well.

The stock was found in good order, the dairy herd much improved and the cows giving a good supply of milk, which was proving a great assistance to the Government Dairy Station near by. Some additions to the buildings were needed, and these have since been made. Arrangements were also effected at the time of my visit for a good supply of excellent water from a spring found at the rear end of the farm. A reservoir has since been constructed near the source of the spring and pipes laid to the barn and dwellings, which will supply an abundance of good water which has long been needed.

In the horticultural division of the work the fruit trees had for the most part wintered well, and many of those in the orchards were bearing fruit. A large number of small fruits and vegetables were under test and most of the ornamental trees, shrubs and hedges were making satisfactory progress. The flowers, both perennial and annual were making a very attractive display.

BRANDON, MANITOBA.

The annual journey of inspection westward was made in August. The crops at the Brandon experimental farm, notwithstanding the very dry weather in the spring, were very good. The various sorts of wheat under test there averaged about 30 bushels per acre, barley from 40 to 50 bushels, and many of the varieties of oats being tested in experimental plots exceeded 100 bushels per acre. This farm was in good order, the land had been carefully prepared and the weeds were kept well under. The corn and root crops also promised well, and the yield of potatoes was unusually good.

The forest belts, avenues and ornamental trees and shrubs are all making good progress, and add very much to the attractiveness of the farm and furnish much useful shelter. The stock also was found to be in good condition and satisfactory progress in this branch of the work had been made. Some of the small fruits had given fair crops and quite a number of wild plum trees were found fruiting. The large collection of trees and shrubs and ornamental hedges, which have been planted about the Superintendent's residence, associated with large beds of annual and perennial flowers, now forms a very attractive feature at this farm and receives much attention from visitors.

INDIAN HEAD, N. W. T.

Although this district had suffered much from dry weather in the spring, the copious rains which fell late in June had brought the crops along at a marvellous rate of growth so that by harvest time the fields were as heavy with grain as I had ever seen them. Oats were scarcely so heavy as at Brandon, but the best yielders ran from 70 to 80 bushels per acre. Barley also was a good crop, much like that at Brandon, most of the varieties ranging from 40 to 55 bushels per acre, while the wheat was a heavier yield than at Brandon, many fields giving from 35 to 40 bushels per acre. These good crops have again prevailed over the greater part of that fertile district and in every instance where the land has been well prepared the labours of the husbandman have been amply rewarded.

The large plantations of forest trees, the avenues and wind breaks of various sorts in which there have now been planted over 100,000 trees are making excellent progress, and have made this once bare prairie farm a veritable garden spot on the plains, adding greatly to the beauty of the farm and at the same time affording shelter for buildings, stock and crops.

Continued success attends the experiments with Brome grass, some of the fields at the time of my visit affording excellent pasture. Owing to the very dry spring and the fact of this being a very early grass, the crops both of hay and seed were much lighter than usual. In spite of these drawbacks some of the newer fields did very well. The cultivation of this grass is spreading with great rapidity and it is proving a boon to the settlers everywhere.

The stock, buildings and crops on this farm were all found in good condition and gave evidence of constant and thoughtful care.

AGASSIZ, B.C.

The grain crops at the experimental farm for British Columbia were found to be very fair. Spring wheat ranged from 20 to 25 bushels per acre, oats from 50 to 75 and barley from 30 to 40 bushels. Indian corn has done very well and has given from 20 to 35 tons of well matured fodder per acre, while the crops of field roots and potatoes have been unusually large. The orchards had made very satisfactory growth and many of the younger apple trees were bearing heavily while many older trees were giving light crops. Pears were only a fair crop but included some new sorts of much promise. Plums produced most abundantly and a large quantity was being marketed at the time of my visit. Many of the new sorts were also fruiting. Some very fine varieties of peaches were produced, but the crop of this fruit was light. Many additions have been made to the plantations of small fruits, and also to the number of large fruits under trial.

An additional area of land has been cleared and brought under cultivation. The forest trees, hedges and ornamental trees and shrubs, had all made satisfactory growth, and the general appearance of the farm and the condition of the buildings and stock all indicated careful management.

CHANGES IN THE STAFF.

The only change made during the past year has been the appointment of Mr. W. T. Macoun, formerly the Director's Assistant and Foreman of Forestry, to the position of Horticulturist, occupied until recently by Mr. John Craig.

CORRESPONDENCE.

The following is a summary of the letters received and sent out at the Central Experimental Farm, from 30th November, 1897, to 30th November, 1898, also of the number of reports, bulletins and circulars forwarded by mail during the same period.

—	Letters Received.	Letters Sent.
Director and Acting Agriculturist	49,899	16,425
Horticulturist	690	1,073
Chemist	1,298	1,904
Entomologist and Botanist	2,331	2,506
Poultry Manager	1,583	1,429
Accountant	1,403	1,810
Totals	57,204	25,147

Circular letters sent, including circulars sent with samples of seed grain, 152,351.
Number of reports and bulletins mailed, 214,532.

The volume of correspondence received during the past year has been larger than in any previous year. Much of the increase, however, in letters received by the Director and in circular letters mailed was due to a revision of the mailing list made during the year.

ACKNOWLEDGMENTS.

Grateful acknowledgments are due to the Director of the Royal Gardens, Kew, England, for another useful and valuable collection of seeds of trees, shrubs and plants obtained from different countries. Many packages of the seeds of rare and promising varieties have also been received from the Director of the Arnold Arboretum, Jamaica Plains, Mass. Collections of seeds have also been received from the Agricultural Department of the Government of India. To Prof. John Macoun, Naturalist of the Geological and Natural History Survey, and to Mr. J. M. Macoun, Assistant Naturalist, my hearty thanks are due for seeds of some rare species collected in different parts of the Dominion.

I take pleasure also in acknowledging the continuance of the faithful services rendered by all the officers at the central and branch experimental farms and for their earnest co-operation in carrying on the many lines of experimental work which have been planned.

Special acknowledgments are due to those members of the staff who have rendered me much efficient help in carrying on those branches of the work of which I have had the personal charge. To the Farm Foreman, Mr. John Fixter, who has carefully managed and watched over the field experiments and taken notes on the crops at different stages in their growth. To Mr. Harry Fixter, who has had charge of all the uniform test plots of cereals, also of the small plots of newly introduced varieties, including new cross-bred and hybrid sorts, and has taken records of the growth and yield of all the varieties tested. I am also indebted to him for his careful management of the work in connection with the distribution of samples of seed grain. From Mr. R. R. Elliot, Herdsman, I have also received much valued assistance. He has carefully carried out the work planned in connection with the experiments conducted in the feeding of cattle and swine and has taken notes on the results. Accurate work has also been done by Mr. Wm. Ellis in testing the vitality of seeds, in the propagation of many useful and ornamental plants, and the taking of the meteorological records. The employees also of the farms in every branch of the work have discharged their respective duties faithfully and well.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE HORTICULTURIST.

(W. T. MACOUN.)

DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit for your approval my first annual report as Horticulturist to the Central Experimental Farm. In this report it has been my endeavour to present only such results and features of the work of my department as I consider will be the most valuable to the farmers and fruit growers of Canada, as it is quite impossible in the limited space at my disposal to take up in detail all branches of the work carried on this year.

CHARACTER OF SEASON.

Last winter was not a hard one on trees, shrubs and plants, and the losses and injuries from winter-killing were not great. There was an abundant snowfall, which afforded good protection and prevented the alternate thawing and freezing of the ground, which caused such injury to the fruit trees during the winters of 1895-96 and 1896-97. The spring was an early one, being 10 days earlier than 1897, on the 15th of April ; about 7 days earlier on the 1st of May : and about 7 days earlier on the 1st of June. The frost was out of the ground sufficiently to use the spade on the 12th of April. Nearly all of April was mild, the weather getting cooler, however, towards the close of the month, and on the 19th the temperature went down to 6 degrees below freezing. May and June were warm and little rain fell during those months. There was frost on the 5th and 6th of May, but little injury was done to vegetation. Most of July was dry and hot, but on the 10th the temperature fell to the freezing point in low spots, but did not do any noticeable injury to the fruits and vegetables. August and September were, for the most part, warm and dry, but towards the end of the latter month there were welcome rains, which were much needed, as the season on the whole was very dry. Since that time there has been plenty of rain. The first severe frosts occurred on the 7th and 10th of October, killing the leaves of the grape vines, the cannas, and most of the annuals.

Winter set in on the 26th of November.

FRUIT CROP.

Early apples were a good crop, but some of the winter varieties, though of better size than many of the summer and fall sorts, did not bear heavily this year. There was an abundant crop of both plums and cherries, which were of good quality. Owing to the long, dry, warm fall, the grapes ripened very well this year—130 varieties reaching maturity—and there was an average crop of good fruit. Currants for the most part yielded well, but the English gooseberries were again so badly affected with mildew that there was scarcely any good fruit on the bushes. The American varieties produced good crops, especially the seedlings. A large quantity of gooseberries was destroyed by sunscald this year, owing to the bright, hot weather when they were approaching maturity. This scald was at its worst about the 7th of July. There was only a fair crop of strawberries, owing to the hot weather shortening the season considerably, and the blossoms not being properly fertilized. There were no raspberries of any account, as the plantation is young, but the crop was only fair in this vicinity.

PROGRESS OF THE WORK.

Since my appointment to the position of Horticulturist, in April last, I have tried to master as many details of the work that I was not hitherto familiar with as time would permit, and have continued the work of testing varieties of fruits and vegetables, taking such notes on the same as were likely to be most valuable.

During the summer especial study was made of the Russian apples, of which there are a large number growing in the orchards. It is unfortunate that so much confusion exists in regard to the nomenclature of these fruits, as it is very difficult to determine when a variety is correctly named. The number of names could be reduced considerably with profit, for as many as four synonyms have been found of one variety.

The thorough spraying of the orchards, small fruit plantations and vineyard were also carefully conducted, to prevent the ravages of insect enemies and fungous diseases.

Measurements have again been taken of selected trees in the forest belts, of which the annual growth of the past seven years has been recorded.

Notes were taken, as formerly, on the hardiness, vigour and other characteristics of the trees, shrubs and plants in the Arboretum, and 345 trees and shrubs added to the collection. The labelling of the specimens in the Arboretum has been continued, and more than 500 plants were collected and dried for a herbarium of the Arboretum and Botanic garden.

This autumn, 500 trees, raised from seed of *Pyrus baccata*, hybridized with the larger varieties of apples, were planted in the orchard along its northern boundary. There were also planted at this time 104 shrubs, produced from seed of *Pyrus Maulei* hybridized with *Pyrus japonica*.

All of these hybrids were originated by Dr. C. E. Saunders, or by the Director.

There was also planted along the northern and part of the western boundary, a row of Norway spruce trees for the purpose of forming a wind-break. These trees were planted five feet apart in the row, it being the intention to cut out each alternate one, if deemed necessary, later on. In all, 382 of these trees were planted.

The following is a summary of the approximate number of species and varieties of fruits, vegetables and ornamental trees and shrubs tested at the Experimental Farm this year, which will give some idea of the labour, care and forethought required to carry on the work with accuracy and success :—

Apples	653	Vegetables	1,000
Pears	69	Tobacco	35
Plums	130	Ornamental trees and shrubs	2,700
Cherries	50	Perennial flowers	1,200
Grapes	169	Gooseberries	154
Currants	80	Strawberries	290
Raspberries	128		

Making in all a total of about 6,658 species and varieties under test this year.

The correspondence connected with this division has been considerable, but replies were given as promptly and as satisfactorily as possible. A large number of samples of seedling apples were sent in for examination, the results of which were reported to the sender and opinions given as to their merits.

ACKNOWLEDGMENTS.

To those who have assisted me in naming fruits, identifying diseases of plants, recording the blossoming periods of fruits, and giving me other information sought, I beg to convey my sincere thanks. Among such I would especially mention :—Mr. R. Brodie, St. Henri de Montreal ; Mr. W. H. Dempsey, Trenton, Ont. ; Mr. R. Hamilton, Grenville, Que. ; Mr. R. W. Shepherd, Como, Que. ; Mr. W. W. Dunlop, Outremont, Que. ; Mr. Dearness, London, Ont., and Dr. B. D. Halsted, New Brunswick, N.J., U.S.

My secretary, Mr. J. F. Watson, on account of his familiarity with the records of this division, has been of great assistance to me. I beg also to testify to the zeal of Mr. H. Holz, the foreman of this division, who has endeavoured to keep everything in first class condition and to carry out the work which was planned.

DONATIONS.

The following donations were received during the year, which I beg to acknowledge with thanks :—

Sender.	Donation.
Anderson, J. R., Dept. Agr., Victoria	Roots of *Arctostaphylos media*.
Arnold Arboretum, Boston, U.S.A	Seeds of trees and shrubs.
Buzzell, Miron, Cherry River, Que	Champion of the Earlies potato.
Beach, Prof. S. A., Geneva, N.Y	Seeds of shrubs.
Bergeron, B., Sherbrooke, Que	White Giant, Rose of Erin and Pink Eye potatoes.
Bennett, Maurice, Ottawa, Ont	Scions of Pomme Royale apple.
Black, R. J., Bremen, Ohio	Scions of Wells apple.
Burpee, Atlee, Philadelphia, U.S.A	Seeds of new varieties of flowers and vegetables.
Burpee, Mr., Gibson, N.S	Scions of Mudpig apple.
Botanic Gardens, Belgrade, Servia	Seeds of trees, shrubs and perennials.
Botanic Gardens, Lausanne, Switzerland	79 packages of seeds of perennials.
Bulley, A. K., West Kirby, Cheshire, England	Seeds of perennials.
Craig, Wm., Maritana, Que	Scions of Guerin apple.
Doherty, G. A., Leamington, Ont	Seedling potato.
Darling, J. K., Almonte, Ont	Samples of potatoes and Craig seedling potato.
Faraho, J. P., Wetaskiwin, N.W.T	Seeds of *Prunus domestica besterciensis*
French, G., Melbourne, Australia	Seeds of economic plants.
Gilchrist, A., Toronto, Ont	Plants of Hybrid roses.
Girdwood, Mrs., St. Anne de Bellevue, Que	Roots and cuttings of climbing plants, greenhouse plants.
Graves, W. J., Perry, Ohio, U.S.A	Two trees of Graves peach.
Hamilton, R., Grenville, P.Q	Scions of Amtmann, St. Peter, Flat Aport and seedling apples.
Hobron, Rev. H. F., Yatung, Tibet	115 packages of seeds of trees, shrubs, and perennials.
Hutt, Prof. H. L., Guelph, Ont	Currant cuttings.
Jephson, Mrs. S. Nenagh, Ont	Scions of seedling pear.
Kew, Royal Gardens, England	150 packages of seeds of trees, shrubs and perennial plants.
Lagace, Jules, St. Hilaire, P.Q	Apple scions.
Leef, W. H., Orillia, Ont	Scions of red and yellow seedling plums.
McIntosh, A., Dundela, Ont	Three trees of McIntosh Sweet apple.
Macoun, Prof. J., Geological Survey	Seeds of Western plants.
McCurdy, M., Burlington, U.S.A	Purple potato.
Marsh, H. C., Muncie, Ind., U.S.A	Early Andes, Early Dawn potatoes.
Marsh, J. D., Mille Roches, Ont	Scions of seedling apple.
Meany, E. S., Seattle, Wash., U.S.A	Seeds of Western trees, shrubs, and plants.
Perron, A., St. Hilarion, Que	No. 1 and No. 2 potatoes.
Stephens, C. L., Orillia, Ont	Seedling plum tree.
Spramoter Co., London, Ont	Spray pump.
Whyte, R. B., Ottawa, Ont	Currants, raspberries, perennials.
Washington, Dept. of Agr., U.S.A	Young trees and shrubs; scions and cuttings; seed of Russian cherries.
Yeisley, Chas., Lisbon, Iowa, U.S.A.	Grape scions.

I have the honour to be, Sir,

Your obedient servant,

W. T. MACOUN,

Horticulturist.

HISTORY OF RUSSIAN FRUITS AS GROWN AT THE CENTRAL EXPERIMENTAL FARM, 1888–1898.

As much time as possible was devoted, this season, to the study of the Russian fruits growing on the Farm, for the purpose of determining those varieties which were succeeding best and those which were of the best quality; and also of ascertaining which of the so-called varieties were synonyms. The history of these fruits up to the present time as grown at the Central Experimental Farm has also been worked up as far as possible, partly from the reports of the late horticulturist, partly from other data regarding them, and partly from the trees as they now stand in the orchards. The results of this work are here given.

A large number of Russian fruits have now been tested for ten years at the Central Experimental Farm. In the year 1888 there were planted in the orchards here 133 supposed varieties of apples, 28 of pears, 8 of plums, and 38 of cherries. Since that time, others have been added at intervals, and notwithstanding those which have been winter-killed, there are now about 160 supposed varieties of apples in the orchard, 18 of pears, 28 of cherries, and 7 of plums. A few of the apple trees planted in 1888 fruited in 1890. The trees did well and made vigorous growth up to the year 1892, when blight appeared in the pear orchard and continued to spread throughout that summer and autumn, notwithstanding all efforts to hold it in check. All the Russian varieties of pears were affected, 25 trees being killed to the ground. The apples were also affected that year, though not so seriously. In 1893 the disease appeared earlier in the season and committed great ravages, both among the apples and the pears. Many apple trees were reduced to stubs, while the pears were still more badly injured than in 1892. This left these orchards in a very dilapidated condition. Some trees had died altogether, others were reduced to stumps, and again others, which had large diseased limbs sawn off, had lost their symmetry. The trees were not so much affected in 1894 and 1895, but owing to the severity of the winter of 1895-96 a large number were root killed; the last of the pear trees originally planted going at that time. Further injury from root killing occurred in the winter of 1896-97. During the past two seasons, most of the apples and pears which have been replaced, made good growth, and some of the apple trees which were badly affected by blight are regaining symmetrical proportions. Out of about 288 apple trees planted in 1888, there are now 149 trees living, 139 having died, of which 104 died in the spring of 1896, 27 in the spring of 1897, and 8 this year.

The cherries did well at first, beginning to fruit in 1890. In 1895 a very fine crop was produced, but during the following winter nearly all of the trees were root killed. This was owing, in a large measure, to their being grafted on tender stocks. Since that time they have been propagated to some extent on Bird Cherry (*Prunus pennsylvanica*) stock. Some trees propagated on this stock in 1891 continue to do well. An exception to the almost general winter killing of the cherries in 1895-96, was the Koslov Morello, sent out by the Ontario Fruit Growers' Association in 1890. Out of 24 trees, only 5 died from the effects of that winter. These cherries are, however, on their own roots.

The Russian plums planted in 1888 have all been winter killed with the exception of two trees, Early Red and Voronesh No. 102, and these two trees are not very healthy. Other varieties have been planted of late years, and some of these are doing fairly well.

Russian Fruits, 1898.

Last winter was not a hard one on trees and there were scarcely any losses. Most of the trees in the Russian apple orchard, which were old enough, produced a good crop of fruit this year. Owing to the extremely hot dry weather, the summer apples, to which class nearly all the Russian varieties belong, dropped very badly. The trees on the whole made fair growth, No blight was noticed. About 50 varieties among those planted in 1888 and 1890 look thrifty, but some of these are evidently synonyms, which would reduce this number somewhat.

Of the varieties which fruited this year, the following seem to be the most promising :—

Livland Raspberry (Melonen). There seems to be no difference between these apples as grown at the Experimental Farm from observations made this year. Tree upright, fairly vigorous; fruit medium size, roundish conical; skin pale yellow, well splashed and washed with bright red; flesh white, tinged with pink near skin, firm, crisp, juicy, sub-acid, pleasant flavour; good quality. Ripe 3rd August.

Switzer: The Switzer grown at the Experimental Farm does not colour so highly as that grown by Mr. R. W. Shepherd, of Como, P.Q., fruit of which was examined during the summer. Tree moderately upright, fairly vigorous; fruit medium size, oblate; skin, pale green, almost white, splashed and streaked with bright red; flesh, white, firm, crisp, juicy, sub-acid with a high aroma; good flavour; very good quality. Ripe 10th August.

Pointed Pipka (Summer Arabka, Broad Cheek, Throne, 135 Budd): All the trees, under these names seem to be of the same variety, as fruited this year. Tree spreading, vigorous; fruit above medium size, oblong, conical, ribbed; skin, pale yellow, well splashed and streaked with purplish-red; flesh white, rather coarse, juicy, mild sub-acid, pleasant flavour, good quality.

Romna (Hibernal, Aport, 244 Beadle, Longfield 56 M. —not Longfield as generally grown—, Silken Leaf): These are all apparently the same apple, as fruited at the Experimental Farm this year. Tree vigorous, spreading; fruit above medium size, sometimes large, oblate, conical; skin greenish-yellow, streaked and splashed with purplish-red; flesh yellow, tender, melting, juicy, acid; quality medium. Ripe last week of September. This is more valuable as a cooking apple than as a dessert fruit. It is one of the most vigorous trees that we have.

Plikanoff: Tree planted 1893, vigorous, spreading. Fruited for the first time this year. Fruit large, roundish, slightly conical; skin, yellow, well washed with bright red and splashed with a darker shade; flesh yellowish, tinged with red, rather coarse, fairly juicy, sub-acid, good flavour; good quality. Season probably October.

Repka Winter: Tree upright, fairly vigorous; fruit above medium size, oblate, flattened; skin yellowish-green, lightly streaked and splashed with purplish-red; flesh white, crisp, fairly juicy, mild sub-acid; quality medium. Will probably keep until February.

Antonovka: Though sometimes favourably mentioned, this will, on account of its lack of colour, it being a yellow apple, probably not be a profitable variety.

Winter Arabka: Did not fruit here this year. It is considered one of the best of the Russian varieties, and is a winter apple.

The Switzer and Pointed Pipka are the only two varieties fruiting this year which can compare with dessert apples of their season in the best apple districts of Ontario.

In the year 1890 a Russian seedling orchard was planted, comprising about 3,000 trees grown from seed, imported from E. Goegginger, Riga, Russia. The seed from which these were grown was said to have been taken from apples grown north of Riga. Of these there are now 1,016 remaining, the rest having been killed by blight or winter. These began to fruit last year, and this year about 60 trees bore. None of these apples are sufficiently promising to be worthy of special mention, but a few of them are as good as the majority of the Russian varieties. They will he further tested at Ottawa, and scions sent to the farms at Brandon and Indian-Head to determine whether they are hardy there or not. The rest of the trees which fruited this year will be cut out.

Pears.—The Russian pears, planted since 1895, have done well and have not been much affected by blight since that time. Only one variety, the Baba, fruited in the pear orchard this year, but two others, Gliva Kurskaya, and Sapieganka, which have borne heavy crops annually in the Director's Experimental garden for some years, were again loaded this season. The Russians pears yet tested at Ottawa are in season but a very short period when they get soft and mealy. If used at the proper time, they are fairly good to eat raw and are very nice when preserved, but are not worth planting where other varieties will succeed.

Plums.—The European plums have not done well in the orchard at the Experimental Farm. The situation is very exposed and the trees have suffered severely. This

year, four Russian varieties fruited, namely, White Nicholas, Early Red, Voronesh (blue) and Yellow Voronesh. All of these but Voronesh (blue) are of good quality. The Yellow Voronesh is almost as large as Yellow Egg and of somewhat the same shape, is fairly juicy, sweet, and of good flavour ; cling stone ; good quality. Ripe 22nd August. Two of the hardiest of the European class of plums yet tested here are the Glass Seedling and Richard Trotter.

Cherries.—Of the cherries planted in the orchard from 1888 to 1895, the following varieties have survived : Strauss, Minnesota Ostheim, Ostheim, Cerise d'Ostheim, No. 207, Koslov Morello, Heart-shaped Weichsel, Orel 24, Riga 18, Orel 27, Shadow Amarelle, No. 206, Orel 25, Griotte du Nord, Spate-Amarelle, Brusseler Braun, June Amarelle, Lutovka, Amarelle Hative. Most of the trees of those varieties which were planted in 1888 do not look as if they would live much longer. These trees are on tender stocks. Trees of a number of varieties in a nursery row, propagated on the bird cherry, *Prunus pennsylvanica*, in 1891, are very healthy, and produced a heavy crop of fruit this year, as did also most of the other cherry trees which were old enough to bear. The best of the European and Russian cherries ripened in the following order this year : Amarelle Hative, 26th June. June Amarelle, 2nd July, Shadow Amarelle, 3rd July. Heart-shaped Weichsel, 8th July. Griotte du Nord, 8th July. Orel 25, 8th July. Cerise, d'Ostheim, 12th July, Brusseler Braun, 25th July, Koslov Morello, 26th July. These cherries gave a continuous succession of fruit for about five weeks. The apparent gap between 12th July and 25th July is filled up by the Ostheim, the fruit of which ripened rather unevenly this year.

The Koslov bush Morello cherries, received from the Ontario Fruit Growers' Association in 1890, deserve special mention. These little, bush-like trees, after eight years growth, now average only about 5 feet 6 inches in height.

There are 21 trees yet living out of the original 25 planted. Of these, 15, nearly all of which appear to be different, produced fruit this year. This is the first year that they have fruited to any extent, although planted for eight years. Most of the trees produced fruit of inferior quality, some being bitter, and others very acid. Two of the most promising, on account of their hardiness and lateness in ripening, are the following :—

Koslov Morello (R. 6. T, 29). Tree bushy, height, 5 ft. 7 in. Heavy crop ; fruit large, long, heart-shaped, slightly flattened, firm ; stalk very long, slender ; suture rather indistinct ; skin, deep red ; flesh deep red, juicy, very acid ; pit large, long. Ripe 20th July. Would probably make a good preserving cherry.

Koslov Morello (R. 6. T. 27). Tree bushy, height, 6 ft. 6 in. Fair crop ; fruit large, heart-shaped, rather deep red, firm ; stalk long, stout ; suture, distinct ; flesh bright red, very acid ; pit large, oval, flat. Ripe 26th July.

The observations made this year, and the opinions drawn, are unbiassed, and should another year's experience change my views on the varieties mentioned, I shall be glad to express them.

APPLES.

There are about 653 varieties of apples in the orchards, of which, as already stated, about 160 kinds are Russian. Of this large collection 191 varieties fruited this year. The crop, on the whole, was good, the summer and autumn sorts especially being heavily loaded. Owing to the continued dry weather, the fruit dropped very badly, as was the case in other sections of the country. The fruit of the winter varieties was of good size, but the earlier sorts seemed to be prematurely ripened, and were small, Wealthy, especially, which fruited very heavily, was considerably under-sized. The crop from each tree was measured and a record made of it. This will be done from year to year, in order to learn the productiveness of the different varieties. The trees, for the most part,

made good growth, the leaves being dark green and healthy looking, but in many cases the heart wood of the trees is of an unhealthy colour, indicating that they are not in the condition they should be. This may be due either to the unsuitableness of the climate, to the character of the sub-soil, or some other cause not yet known. Aphides were not troublesome this year. In the spring, before the buds expanded, they were covered with these insects. The trees were sprayed at that time with a mixture of tobacco, water and whale oil soap, made with 10 lbs. of tobacco, 2 lbs. of whale oil soap, and 40 gallons of water. They were sprayed again on the 2nd and 5th of May. The aphides did not occur in sufficient numbers, throughout the summer to cause appreciable injury. The trees received 1 spraying with a copper sulphate solution and 4 with Bordeaux mixture and Paris green. There was scarcely any scab on the fruit, but the Codling Moth, notwithstanding the thorough sprayings the trees received, did considerable injury, especially during late summer. Many of the trees, especially those that are unhealthy, are affected with Oyster-shell Bark-louse, and this is a troublesome insect to fight.

Only 13 trees died during the winter of 1897-98, and these were all injured previously at the roots by winter-killing. On the 25th of July a windstorm uprooted and destroyed 14 trees. All of these also had been previously injured at the roots. The following is a list of most of the standard varieties which appear to be thriving best:

List of standard varieties of apples shriving best.

Baxter.	Malinda.	Salome.
Ben Davis.	McIntosh Red.	Scott's Winter.
Canada Baldwin.	McMahan White.	Stark.
Delaware Red Winter.	Missouri Pippin.	Swayzie Pomme Grise.
Duchess.	North Star.	Tetofsky.
Duke of Connaught.	Patten's Duchess.	Wealthy.
Gano.	Patten's Greening.	Winter Bough.
Gideon.	Pewaukee.	Winter St. Lawrence.
Haas.	Plumb's Cider.	Wolf River.
Lawver.	Red Astrachan.	Yellow Transparent.
Longfield.	St. Lawrence.	

PEARS.

Pears have not been a success in the orchard at the Experimental Farm. From year to year since the first trees were planted, they have been winter-killed or destroyed by blight, so that to-day nearly all the trees in the orchard are comparatively young. None of the trees died last winter, and this year they made good growth and were free from blight. Only four varieties fruited this year, namely, Baba, Coleman's Butter, Longworth, and Flemish Beauty. The Baba is larger than any of the other Russian pears fruited at the Experimental Farm, but is no better in quality. Flemish Beauty seems to be the hardiest variety of the better class of pears yet tested here.

Arrangements have been made to top graft some of the Russian varieties next spring with scions of the better class, in the hope that they will succeed better.

This autumn there were 69 varieties of pears living in the orchard, of which 18 are Russian.

PLUMS.

There are now 130 varieties of plums in the orchard, a large proportion of which have been planted during the past three years, as during the winter of 1895-96 many of the tenderer sorts were root-killed, and these have been replaced by others since that time.

Throughout most of the fruit growing districts of Ontario and Quebec, plums were a heavy crop this year. A plentiful supply of snow prevented root-killing, little injury

was done to the fruit buds, and the flowers seemed to have been well fertilized, so that these three important factors were favourable to the production of a good crop. At the Experimental Farm most of those trees of the American varieties of plums which were old enough were heavily laden with fruit. Our native varieties also produced large crops, and the few European sorts which were in bearing, yielded well.

The aphides, (which were very troublesome), plum blight and curculio were all successfully combated by the use of tobacco water, whale oil soap, Bordeaux mixture and Paris green, prepared in the manner mentioned elsewhere.

The following American varieties were the most promising this year from the standpoint of hardiness, productiveness, vigour of tree, and quality of fruit. They ripened in the order given: Cheney, 26th Aug.; Wolf, 3rd Sept.; Wyant, 9th Sept.; Stoddard, 9th Sept.; DeSoto, 14th Sept.; Van Buren, 26th Sept. Hawkeye which is one of the best of the American plums did not fruit this year. There are a number of other varieties of good quality which began to bear this season, among which are New Ulm, ripe 29th Aug; Ocheeda, ripe 4th Sept.; Comfort, 20th Sept.; Forest Garden, 26th Sept.

CHERRIES.

During the winter of 1895-96 the trees in the cherry orchard were nearly all destroyed by root-killing. This was due partly to the severity of the winter and partly to the fact that the trees were grafted and budded on tender stock. The late horticulturist, since that time, propagated a considerable number of trees on *Prunus pennsylvanica* stock, which has proved very satisfactory here. Those found in the nursery rows were too small to be planted in the orchard last spring, but will be utilized next year. A large number of additional varieties were crown grafted this year, some of which have made 6 feet of growth during the season. There are now 50 varieties in the orchard, of which—were planted this year. Cherries, like plums, were a heavy crop at the Experimental Farm in 1898 on such trees as were old enough to bear.

GRAPES.

There are now 169 varieties of grapes being tested, of which 130 ripened this year. This was a good season for grapes, as the weather was bright and warm during most of September, being very favourable to the ripening of the fruit. The vineyard, which is about 2 acres in extent, is situated on high, light sandy loam soil with a southern exposure. It received a dressing of farm-yard manure last spring, which was ploughed under. It was found that the roots of a considerable number of vines had become exposed by reason of continuous cultivation for the past nine years and on account of the shifting of the soil by the wind, the vineyard being in an exposed situation. It was decided, therefore to discontinue cultivation for this year. After the manure was ploughed under, the ground was harrowed and a strip 5 feet in width seeded down on the 14th of June with Mammoth Red clover and Mammoth Red and Lucerne mixed, at the rate of 12 pounds per acre. The space between this strip and the vines was mulched with strawy manure to prevent the growth of weeds and to conserve the moisture. The clover took well and there is a fine cover crop this autumn. It is proposed to give the vineyard a dressing of wood ashes in the spring, which, with the manure applied this year, should be sufficient fertilizers for some time to come, as it is not deemed advisable to encourage too much growth.

The work of renewing the vines was begun this autumn, as many of the old ones were not very vigorous. This was done by cutting out the old canes and leaving the younger ones to bear the crop.

As, on account of the short season, earliness is one of the chief requisites in varieties of grapes for Eastern Ontario and the province of Quebec, the following table of the

earliest 25 is given to assist planters in making a selection. In this table are given the number of vines of each sort being tested; the date of ripening; colour of the fruit; average yield per vine for several years, and remarks as to quality, etc.

Name.	Number of Vines Tested.	Date of Ripening, 1898	Heaviest Yields per Vine, 1898.		Average Yield per Vine, 1898.		Average Yield per Vine for Five Years.		Colour of Fruit.	Size of Fruit.	Quality of Fruit.
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.			
Florence	3	Sept. 2	8	..	6	5	7	6	Black ..	Above medium..	Poor.
Champion	6	" 3	21	..	16	11	16	..	" ..	" ..	"
Pattison	3	" 6	10	4	7	15	..	..	" ..	Medium	Medium.
Moore's Early	4	" 6	6	8	4	5	3	11	" ..	Above medium..	"
Peabody	2	" 6	7	..	6	2	5	4	" ..	Below " ..	Above medium.
Moyer	2	" 6	7	12	6	8	5	2	Red..	" " ..	Good.
Moore's Diamond	3	" 6	3	4	2	8	4	10	White..	Medium	"
Cottage	3	" 10	10	4	7	3	7	8	Black ..	Above medium..	Above medium.
Potter	3	" 10	6	8	4	13	9	6	" ..	" " ..	"
Jessica	3	" 10	7	..	5	15	9	3	White..	Small	Good.
Lady	5	" 10	6	8	3	12	4	6	" ..	Medium	Above medium.
Early Victor	6	" 10	24	..	15	1	11	3	Black ..	"	Medium.
Golden Drop	2	" 10	4	..	2	10	2	11	White .	Small	Above medium.
Canada	3	" 10	8	4	7	1	4	5	Black ..	"	"
Belvidere	1	" 10	11	8	11	8	6	2	" ..	Medium	"
Telegraph	2	" 12	20	12	13	14	11	12	" ..	Above medium..	"
Aminia	2	" 12	1	4	..	14	2	3	" ..	" " ..	"
Merrimac	6	" 13	13	..	8	4	9	6	" ..	Large	"
Eumelan	3	" 13	17	..	10	7	14	8	" ..	Medium	Good.
Herbert (Rogers 44)	3	" 13	15	8	11	3	16	12	" ..	Large	"
Brant	6	" 13	14	8	11	6	6	4	" ..	Small	Above medium.
Antoinette	2	" 13	5	8	5	..	..	..	" ..	Above medium..	"
Rogers 17	3	" 13	12	..	9	..	14	14	" ..	Large	"
Marion	3	" 13	12	4	11	..	10	14	" ..	Below medium..	Medium.
Janesville	3	" 13	16	8	13	..	6	10	" ..	Medium	"

The following varieties of grapes, which ripen later than those mentioned in the above table, have been grown with success at Ottawa, and most of them being of better quality may be planted with advantage, if the locality is favourable:—

Red.—Delaware, Brighton, Lindley, Agawam, and Vergennes. Vergennes, although a late variety, is a good keeper, and should be grown in localities where it will ripen.

White.—Eldorado, Niagara, Duchess. Eldorado sets its fruit badly, but is of very good quality. Niagara, though a good bearer, is very foxey, and on this account is not liked by many.

Black.—Worden, Wilder, Burnet.

CURRANTS.

The currant crop was good this year, and most of the 80 varieties which are being tested, that were old enough to bear a crop, yielded well. Those varieties which were planted recently did not fruit, and of these 16 were planted this year. The plantation of currants is now made up of 44 black varieties, of which 26 are seedlings originated by Dr. Wm. Saunders; 32 red varieties; and 4 white varieties. The seedling black currants, of which special mention was made of the most promising in the report of the horticulturist for 1897, again yielded well this year. Standard, Success, Climax, and Beauty being worthy of special notice. Among the newer red varieties, that known as Greenfield is one of the best. This is a seedling originated by Mr. S. Greenfield, Ottawa East, Ont. For habit of bush, productiveness, and size of fruit it ranks among the best.

In the following table will be found the yields of the different varieties for this season, with other data regarding them :—

CURRANTS—RED.

Name.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield per Bush. Lbs.	Oz.	Average Yield per Bush. Lbs.	Oz.
Greenfield	July 7..	Medium to large..	5	37	12	7	9
Red Dutch	" 6..	Small to medium..	5	33	4	6	10
London Red	" 9..	Medium to large..	5	29	8	5	14
2/2	" 7..	" ..	5	27	4	5	7
Red Grape	" 9..	" ..	5	25	4	5	1
Wilder	" 9..	Large	5	24	2	4	13
Raby Castle	" 7..	Small to medium..	5	23	..	4	10
La Conde	" 7..	" ..	5	23	..	4	10
Cherry	" 7..	Medium	5	21	4	4	4
North Star	" 6..	Medium to large..	5	15	..	3	0
Prince Albert	" 20..	Large	5	11	..	2	3
Versaillaise	" 9..	Very large	5	10	8	2	2
Victoria	" 7..	Large	5	5	12	1	2
Ribes Striatum	" 9..	Small.	5	3	12	0	12
Fay's Prolific	" 7..	Very large	5	3	12	0	12
Fertile d'Angers	" 7..	Large	5	2	12	0	9

WHITE.

Name.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield per Bush. Lbs.	Oz.	Average Yield per Bush. Lbs.	Oz.
Climax	July 6..	Medium	5	19	12	3	15
White Grape	" 2..	"	5	19	10	3	15
White Dutch	" 2..	"	5	3	12	..	12

BLACK.

Name.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield per Bush. Lbs.	Oz.	Average Yield per Bush. Lbs.	Oz.
Ethel	July 2..	Medium to large..	5	27	8	5	8
Kerry	" 2..	" ..	5	26	4	5	4
Stewart	" 6..	Large	5	24	12	4	15
Eagle	" 2..	Medium	5	21	4	4	4
Black Champion	" 13..	Small to medium..	5	20	12	4	2
Charmer	" 2..	Large	5	20	8	4	2
Climax	" 7..	Medium to large..	5	20	..	4	0
Prince of Wales	" 11..	Medium	5	19	12	3	15
Ontario	" 2..	Medium to large..	5	17	4	3	7
Eclipse	June 29..	Large	5	16	..	3	3
Mattie	... .	...	5	15	8	3	2
Orton	July 3..	Medium to large..	5	15	..	3	0
Winona	June 28..	Large to very large	6	14	..	2	5
Standard	July 2..	Large	5	13	12	2	12
Victoria Black	" 7..	Very large	5	13	8	2	11
Monarch	June 29..	Medium	5	13	..	2	10
Dominion	July 4..	"	5	12	12	2	9
Clipper	" 4..	Small to medium..	5	12	8	2	8
Stirling	" 4..	Medium	5	11	12	2	6
Beauty	" 2..	"	5	11	8	2	5
Black English	" 4..	"	5	10	8	2	2
Perry	" 6..	"	5	10	8	2	2
Success	June 28..	Very large..	5	9	8	1	14
Ogden	July 7..	Small to medium..	3	7	12	2	9
Oxford	June 28..	Medium to large..	5	6	12	1	6
Star	July 4..	Medium	5	5	12	1	2
Black Naples	" 11..	"	5	4	12	..	15
Perth	" 1..	Large	5	3	4	..	10
Lewis	" 1..	Small to medium..	5	3	..	..	10

RASPBERRIES.

The present raspberry plantation was begun in 1896. Most of the plants were put out in the autumn of that year, but a large proportion of these died. In 1897 little replacing was done, so that the plantation this spring presented a very broken appearance. As many varieties as possible were procured from Canadian nurserymen, but their lists were limited and there was not time to procure many others from Europe, and the San José scale bill prevented importations from the United States, hence this autumn there are yet a large number of blanks to fill. It is expected that a sufficient number of varieties will be procured before next spring to fill the vacant places, but it will be at least two years before uniform and comparative results can be obtained from many of the varieties. There are now in the plantation 75 varieties of red, purple, and yellow raspberries ; 18 of blackcap raspberries ; and 35 of blackberries and dewberries or 128 varieties in all.

STRAWBERRIES.

There are about 290 varieties of strawberries in the plantation which are all being tested under as nearly similar conditions as possible. These wintered well and most of them produced fairly good crops this year. In the Ottawa district a large proportion of the strawberries were more or less deformed and those at the Experimental Farm were not an exception. This was not caused by the bi-sexual and pistillate varieties not being properly intermixed, as those at the Farm were planted with that end in view. The cause was probably due to the hot winds and the unusual dryness of the atmosphere this year, which may have injured the pistils and prevented the proper formation of the berries. The earlier varieties did not seem to suffer so much as the later sorts, although their season was shortened. Preparations have been made for a new plantation of strawberries next spring.

The following twenty-five varieties have given the best returns this year, these being arranged in the order of their yield :—

Variety.	Bisexual. Pistillate.	Date of First Bloom.	Date of First Picking.	Date of Last Picking.	Yield from 1 row 30 ft. long.	Estimated Yield per acre.
	Sex.				Boxes.	Boxes.
Wilson	B	May 19	June 16	July 5	23¼	9,645
John Little	B	" 23	" 18	" 4	21	8,712
Clyde	B	" 17	" 16	" 2	19⅔	8,159
Glen Mary	B	" 22	" 16	" 5	19½	8,090
Boynton	P	" 19	" 16	" 5	18½	7,675
Great Pacific	P	" 24	" 22	" 2	17	7,053
Buster	P	" 27	" 22	" 5	16⅞	7,001
Mary	P	" 25	" 22	" 4	16⅓	6,776
Crescent	P	" 22	" 18	" 4	16	6,638
Carleton	P	" 24	" 22	" 5	16	6,638
Beder Wood	B	" 15	" 20	" 5	15	6,223
Carrie	P	" 19	" 22	" 5	14¾	6,119
Lovett	B	" 22	" 20	" 5	14¼	5,912
Daniel Boone	P	" 24	" 22	" 5	14¼	5,912
Cosette	P	" 24	" 22	" 2	14	5,808
Wesley	B	" 22	" 18	" 5	13¾	5,704
Shirts	B	" 25	" 22	" 4	13$\frac{5}{7}$	5,689
Edgar Queen	P	" 22	" 22	" 2	13½	5,601
Logan	B	" 23	" 18	" 5	13½	5,601
Tubbs	B	" 24	" 25	" 4	13½	5,601
Green Prolific	P	" 24	" 18	" 5	13¼	5,497
Barton's Eclipse	P	" 22	" 20	" 5	12¾	5,289
Cyclone	B	" 22	" 18	" 2	12⅔	5,255
Stayman's No. 1	P	" 26	" 22	" 5	12½	5,186
Epping	P	" 22	" 18	" 4	12⅓	5,117

The yields of some of the well-known varieties, which do not appear in this list, estimated on the basis of 1 row 30 feet long, were:

Princess	$12\frac{1}{4}$ boxes.	Greenville	$11\frac{2}{3}$ boxes.
Parker Earle	$11\frac{1}{4}$ "	Warfield	$10\frac{3}{4}$ "
Martha	$10\frac{1}{2}$ "	Wm. Belt	$10\frac{1}{4}$ "
Williams	$9\frac{1}{4}$ "	Bubach	$8\frac{1}{2}$ "
Haverland	$8\frac{1}{2}$ "	Marshall	$4\frac{1}{2}$ "

Other varieties which did well on smaller areas, the yields of which are here estimated on the basis of 1 row 30 feet long, are:

Ada	25 boxes.	Bisel	$23\frac{1}{2}$ boxes.
Schuster's Gem	14 "	Saunders	$13\frac{1}{2}$ "
Margaret	14 "	Charlie	$12\frac{1}{2}$ "

GOOSEBERRIES.

In the gooseberry plantation 154 varieties are being tested; of these 105 are European, 6 American named varieties, and 43 seedlings and cross-bred sorts. Nearly all the European varieties were injured to such an extent with mildew that they have proved quite unprofitable here. This is probably due, in part, to the fact that the soil is unsuitable, it being sandy loam and not very moist; as in some gardens in this vicinity where the soil is heavier and more moist gooseberries do not seem to suffer much from mildew. All the varieties were layered this year and a new plantation will probably be made next spring, if the layers are sufficiently rooted, on heaver and moister ground, although there seems to be no soil in the orchard enclosure quite heavy enough for this fruit. The European varieties, which were freest from mildew were Whitesmith, Riccardo, Crown Bob, King of Trumps, Red Humbro, Rifleman, and Slaughterman. Owing to the continued hot weather this year, in July, when the gooseberries were approaching maturity, the fruit suffered badly from sunscald. For two years in succession this has injured the fruit very much in this neighbourhood. Those who allowed the saw fly to eat the leaves off their bushes, lost a larger per cent of fruit than those who sprayed, as the leaves were a protection from the sun. A number of cross-bred and seedling varieties, originated by Dr. Wm Saunders, are quite promising. Some of these are almost as large as the best English varieties, and were free from mildew this year, except in rare instances, grown under the same conditions as the other varieties. The following are descriptions of a few of them:—

Saunders.—Bush, a vigorous grower and a moderate bearer. Fruit very large, nearly round, sometimes slightly oval, brownish red, smooth; pulp sweet, sprightly and of fine flavour. Quality very good. Ripe 22nd July. One of the best of the many seedlings grown here. Free from mildew.

Rideau.—Bush, a strong, vigorous grower and a heavy bearer. Fruit medium to large, round, green, smooth with pale prominent ribs; skin moderately thick, but tender; pulp sweet, sprightly but not high flavoured. Quality good. Ripe 26th July. This is a prolific seedling resembling Downing and Pearl. Fruit almost free from mildew. Rarely a few berries slightly affected.

Gibb.—Bush, a strong grower and a medium bearer. Fruit large, oval, sometimes oblong; skin green with an amber tint, smooth; pulp sprightly and of good flavour. Quality good. Ripe 27th July. The amber colour of this seedling makes it easily distinguishable from other varieties. Fruit almost free from mildew; a few berries very slightly affected.

Ruth.—Bush, a strong grower and a very heavy bearer. Fruit medium size, oblong, sometimes oval; skin green, smooth, moderately thick but tender; pulp sprightly, sweet but not high flavoured. Quality good. Fruit nearly, free from mildew; a few berries, only, being slightly affected.

Seedling Gooseberry—Saunders, about two-thirds natural size.

FUNGOUS DISEASES.

Owing to the large amount of other work to be done in connection with this department, not much time has been devoted to this branch of the work. The spraying for the prevention of fungous diseases was, for the most part, such as has been recommended by the late horticulturist, but it is hoped that next year more experiments will be conducted and new experience gained.

A considerable number of samples of diseased fruit, bark, branches, and leaves were received for identification and for information as to remedies. As far as possible, and with the help of experts, satisfactory replies were given.

The species of dry rot of the apple of which mention was made in the reports of the Horticulturist for 1896 and 1897, was again troublesome this year. Red Astrachan, Shiawassee Beauty, Fameuse, Borovinka and Romna were affected. Fameuse was the least affected, but nearly all the fruit of Red Astrachan was spoiled, almost all of one tree of Romna, and the greater part of one tree of Shiawassee Beauty. Most of these trees are too far distant apart to be affected one from the other. This disease is not confined to Eastern Canada, as specimens of fruit affected with it have been received from British Columbia. The cause and life history of this disease is being investigated by Dr. Connell, of Queen's University, Kingston. Samples of diseased fruit were sent to him in 1897, and again this autumn. Under date of 2nd Dec., 1898, he gives the results of his investigations up to that time, which are as follows:—

"In two of the Shiawassee Beauty apples received this autumn I obtained micro-organisms from a single rot 'spot' in each. In all other apples and in remaining 'spots' of these two I could detect no micro-organisms. The organisms obtained in the spots differed from each other; one being a white micro-coccus, the other a yellow bacillus. Evidently both are present in the role of invaders, not as causal agents.

"To sum up roughly my work so far in connection with the dry rot spot. In the first samples sent me early in 1897, I found almost constantly present a fungus resembling *Gloeosporium fructigenum*. Later, however, in other samples obtained from other localities this form was absent, and when I got any micro-organisms at all they were of different species—other fungi, yeasts, sarcinæ, micrococci, and bacilli. All these, to my mind, have no causal relationship to the trouble, and when present they are like those in my recent samples, almost certainly secondary. If the cause be micro-organismal—which I much doubt—then certainly I have so far failed to find any constant form present. Puncture of insects or some nutritional cause are the other factors to be considered."

SPRAYING.

The spraying of the different fruits, ornamental trees, shrubs and flowers was carried on from early spring until it was thought to be no longer necessary, the good results of which were very apparent on nearly everything so treated.

Apples and Pears.—The apple and pear trees were sprayed 8 times, the first spraying being with a sulphate of copper solution on 22nd April, one pound of sulphate of copper to 25 gallons of water. They were sprayed on 13th and 31st May, 16th June and 6th July, with Bordeaux mixture and Paris green, the formula of 4 pounds lime, 4 pounds sulphate of copper, and 40 gallons of water being used. On 23rd April, 2nd May, and 5th May, the trees were sprayed with tobacco water and whale oil soap, made by soaking 10 pounds of waste tobacco in 40 gallons of water and adding two pounds of whale oil soap.

Plums.—The plum trees were sprayed nine times: with Bordeaux mixture and Paris green on 27th May, 7th June, 16th June, and 5th July; with tobacco water on 26th April, 6th May, 28th May, 31st May and 6th July.

Cherries.—The cherry trees were sprayed twice: once with tobacco water and whale oil soap, on 26th April; once with Bordeaux mixture, on 27th May. One more spraying with Bordeaux mixture and one with ammoniacal copper carbonate are recommended, but were omitted this year.

Grapes.—The grape vines were sprayed five times: once with the sulphate of copper solution and Paris green, on 2nd May; and with Bordeaux mixture and Paris green, on 27th May, 16th June, 4th July and 23rd July.

Gooseberries.—The gooseberries were sprayed with Bordeaux mixture and Paris green three times, namely, on 10th May, 30th May and 9th June.

Besides the above, certain ornamental trees and shrubs and flowering plants, affected with different diseases and insect pests, were sprayed when it was deemed necessary. The Larch trees, for instance, were sprayed with Paris green to kill the saw-fly; the roses were sprayed with Paris green and tobacco water; the snowballs were sprayed with tobacco water to kill the Aphides. The dogwoods were sprayed with kerosene and water to kill the oyster-shell bark-louse, and the irises were sprayed with Bordeaux mixture to prevent disease. Owing to the depradations of the forest tent caterpillar in this district, there were more people than usual inquiring about spray pumps, and after seeing those in operation at the Experimental Farm they went away with the determination to purchase one.

COVER CROPS.

The clover sown for cover crops on 1st August, 1897, in the orchards, mention of which is made in the report of the Horticulturist for that year, came through the winter in splendid condition. Nowhere was there any winter-killing and when growth began it was a fine sight to behold. On the 13th June clover in the crab apple, pear, and plum orchard was turned under. Part of this land was re-seeded on the 14th July, with Mammoth Red clover, at the rate of 12 pounds per acre, and part with about equal parts of Mammoth Red clover and Lucerne mixed. This formed a good covering by autumn. In a part of the apple orchard where the soil is very poor, the clover was ploughed under on the 26th May. The land was harrowed and pease were sown at the rate of 2½ bushels to the acre on 1st of June. On the 22nd July, when the pease were beginning to bloom, and about 2 feet 6 in. high, they were turned under, and, after harrowing, equal parts of Mammoth Red and Lucerne clovers were sown at the rate of 12 pounds to the acre. Owing to the very dry autumn, the Mammoth Red clover did not make as vigorous a growth as could be desired, but the Lucerne was 11 inches in height when frozen. These two crops of leguminous plants ploughed under this season will improve the texture of the soil and enrich it considerably. The clover in the greater part of the apple orchards was not ploughed under this year. This is contrary to what is usually recommended, but it was left for several reasons. In the first place, the soil in the orchard is a sandy loam which is easily moved by the wind. During the years in which the orchards have been under cultivation, the soil has blown away so much from a number of the trees that the roots are more or less exposed. A second reason why it was left, was to determine whether the trees would seem to suffer in time of drought. Notwithstanding the exceptionally dry summer which we had, neither the clover nor the trees seemed affected by drought, except in a small portion of the Russian orchard. This would seem to indicate that the soil in the orchards does not lack moisture. Taking all things into consideration, namely, the texture of the soil, its capacity for holding moisture, the exposure of the orchard, the destruction of purslane, which it seems impossible otherwise to kill, even with thorough cultivation, and the belief that it is better not to encourage too vigorous growth when so near the limit of the successful growing of large fruits, it was thought better not to cultivate this year.

SEEDLING FRUITS.

Besides the fruits sent in for name this year, a number of seedling apples, pears and plums were received for examination. Most of the varieties sent, were not of sufficient value to recommend their being propagated to any extent. A few, however, were promising, and these are described below. The descriptions here given may require modifications in future, as in some cases only one sample of the fruit was received, which may not have been a typical specimen.

It is hoped that correspondents will continue to send samples of fruit in the future, which will be carefully tested and the results of observations made, given to the sender. As there is a special committee of the Ontario Fruit Growers' Association, of which the writer is a member, whose work it is to report on new fruits, brought under their notice, it is desirable that at least four—and if possible, eight—samples of the fruit be sent from persons living in that province, in order that they may be submitted to the four men, who comprise this committee, as in this way the opinions of four, instead of one, would be had of the fruit, and fairer conclusions could be drawn.

141	P.E.I. ..	P. Robertson, New Perth..........	Apples of medium quality.
142	" ..	R. Macneill, M.D., Little York......	A streaked apple ; quality, medium.
143	" ..	J. H. Gill, Little York..............	Probably a seedling ; red ; quality, above medium.
144	" ..	A. W. Tanton, Southport...........	A large, sweet apple, of medium quality.
145	N. B....	F. S. Taylor, White's Cove........	Too small to be valuable.
146	P. Q....	R. Boa, Lachute......................	A pretty apple of medium quality.
147	" ...	J. C. Stockwell, Danville..........	Resembles Princess Louise somewhat.
148	" ...	Mrs. S. C. Smith, Sherbrooke East.	Probably seedlings ; of not high merit.
149	" ...	R. Hamilton, Grenville.............	Promising, early red apple of good quality.
150	" ...	W. T. Johnston, Inverness..........	Two seedlings ; neither promising.
151	" ...	J. Lagace, St. Hilaire	Medium size and quality ; red.
152	" ...	" "	Medium quality.
153	Ont.....	J. S. McCallum, M.D., Smith's Falls	Above medium size ; yellow and red ; good quality.
154	" ...	S. Greenfield, Ottawa.............	Large ; handsome ; medium quality.
155	" ...	" "	Medium size ; red ; medium quality.
156	" ...	P. Selwyn "	Small ; yellow ; medium quality.
157	" ...	T. A. Harsant, Glen Orchard........	Small ; red ; medium quality.
158	" ...	" "	Medium size ; splashed and washed with red ; medium quality.
159	" ...	T. Sole, Sarnia......................	Probably seedling ; large ; red ; medium quality.
160	" ...	" "	Large ; green ; good quality ; late winter.
161	" ...	L. L. Livingston, Frankville	A large, green apple, of medium quality.
162	" ...	J. D. Marsh, Mille Roches.........	No. 1. Quality, above medium ; late winter.
163	" ...	" "	No. 2. Promising ; quality, good ; late winter.
164	" ...	" "	No. 3. Quality, medium ; late winter.
165	" ...	Wm. Craig, Maritana..............	Lazure, No. 1. Medium quality.
166	" ...	" "	" No. 2. Quality, below medium.
167	" ...	" "	Dumon. Quality, medium.
168	" ...	" "	Guerin. Quality, above medium.
		PEARS.	
169	" ...	Mrs. S. Jephson, Nenagh...........	Medium size ; good quality.
		PLUMS.	
170	" ...	G. H. Fawcett, Ottawa..............	Fruit received not quite ripe.
171	" ...	S. Greenfield, "	Fruit large ; good quality.
172	" ...	E. D. Smith, Winona................	Emerald. Yellow ; good quality.
173	" ...	W. H. Leef, Orillia	Yellow ; too overripe to test ; said to be very hardy.
174	" ...	" "	Resembles Lombard somewhat.
175	" ...	F. Latchford, Ottawa...............	Large, blue plum ; quality above medium.

Record No. 153. Apple seedling. Tested 19th October, 1898. From J. S. McCallum, M.D., Smith's Falls, Ont.

Description.—Above medium, oblate ; skin yellow, splashed and washed with dull red ; dots numerous, prominent, yellow. Cavity narrow, moderately deep ; stalk short, stout ; basin narrow, moderately deep, smooth ; calyx open. Flesh yellowish, juicy, subacid with a pleasant, sprightly flavour. Core small. Said to keep until April. Quality, good. Supposed to be a seedling of Baxter. Scions received, 1897.

Record No. 163. Apple seedling. Tested 16th November, 1898. From J. D. Marsh, Mille Roches, Ont.

Description.—Above medium size, conical, prominently ribbed towards basin. Skin green, splashed and washed with purplish red; cavity deep, moderately wide; stalk short, slender; basin narrow, shallow, wrinkled; calyx closed. Flesh greenish-white, juicy, brisk sub-acid, pleasant flavour, not unlike that of Rhode Island Greening. Core, medium size. Quality good. Season, late winter. Tree said to be fourteen years old and very hardy. Scions asked for.

Record No. 168. Guerin apple. Tested 14th October, 1898. From Wm. Craig, Maritana, Que.

Description.—Large, roundish. Skin greenish-yellow, washed and splashed with deep purplish-red; dots fairly numerous, white, distinct on sunny side. Stalk short, fairly stout; cavity medium depth and width; basin narrow, round, smooth, shallow; flesh white, fine grained, fairly juicy, mild sub-acid. Quality above medium. Season probably October. Said to have originated on the Indian reserves of Caughnawaga.

Record No. 149. Apple seedling. Tested 14th October, 1898, from Robert Hamilton, Grenville, Que.

Description.—Medium size; skin pale yellow, almost entirely covered with deep red; dots few, gray, obscure; cavity deep, open; stalk long, slender; basin of medium width and depth, almost smooth; calyx open; flesh white, tinged with red in places, fine grained, fairly juicy, mild sub-acid; flavour slightly resembles McIntosh Red; core, small. Quality good. Season probably September and October. Scions asked for.

Record No. 154. Seedling apple. Tested 9th November, 1898. From S. Greenfield, Ottawa East.

Description.—Large, roundish, slightly conical; skin pale yellow, splashed and washed with bright red, mostly on sunny side; dots fairly numerous, gray, rather prominent on shady side; cavity narrow, moderately deep; stalk short, stout; basin of medium width and depth, slightly wrinkled; calyx partly open: flesh yellow, juicy, acid; core large. Quality above medium.

Record No. 169. Pear seedling. Tested 9th November, 1898. From Mrs. S. Jephson, Nenagh, Ontario.

Description.—Medium size, obtuse pyriform, surface irregular, with small protuberances; skin green, with a pink blush; cavity shallow; stalk three-quarters of an inch long; basin moderately deep and open, smooth; calyx open. Flesh pale yellow, juicy, sweet, rich, high flavoured; core small. Quality good. Season probably late October and early November. Tree said to be 11 years old and has been fruiting for two years. Scions asked for.

Record No. 173. Emerald plum. Tested 4th August, 1898. From E. D. Smith, Winona, Ont.

Description.—Above medium size, oval; skin yellow; suture distinct; cavity narrow; stalk short, stout; flesh yellow, juicy, sweet, rich, good flavor; freestone. Quality good. Said to bear annually and ripens in July. Scions asked for.

Record No. 176. Seedling plum. Tested 24th September, 1898. From F. R. Latchford, Ottawa.

Description.—Large, oval, deep purple with a blue bloom; suture obscure; cavity narrow, shallow; stalk three-quarters of an inch long; flesh greenish-yellow, juicy, sweet; pit of medium size, oval, clingstone. Quality good. A promising late plum. Tree said to be about 50 years old, producing a full crop every three years, when it bears very heavily. Scions asked for.

Record No. 172. Seedling plum. Tested 21st September, 1898. From S. Greenfield, Ottawa East.

Description.—Large, roundish, almost oval; skin purplish-red with a slight purple bloom; suture distinct, shallow; cavity shallow, of medium width; flesh greenish-yellow, juicy, sweet, rich; pit, large, clingstone. Quality good. Scions asked for.

LIST OF BEST VEGETABLES FOR FARMERS.

When the farmer begins to think of getting his garden seeds, he is often puzzled as to just what to select from the large list of varieties offered for sale by seedsmen. Often, also, he is mislead by the glowing descriptions given by the seed dealers, and purchases varieties which are not satisfactory to him. Still more frequently, however, he has no seed catalogue to guide him, and he simply purchases from a local firm whatever is offered to him. The following list is given of those vegetables which have proved the best and most satisfactory at the Central Experimental Farm, with the hope that it will prove useful to the farmers of Canada in the selection of their garden seeds. In making this list, the quality, yield and time when they are fit for use have been taken into consideration. Quality being considered the most important:—

Asparagus.—Seven varieties are being tested. Connover's Colossal is the best all round variety.

Beans.—Seventy-four varieties were grown this year. Golden Wax or Wardwell's Kidney Wax, for early crop; Early Refugee, for medium; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Southern Crease-back and Asparagus, (early) and Golden Andalusia, (late), are the best pole varieties.

Beets.—Thirty-two varieties tested. Egyptian Turnip, Eclipse, and Bastian's Blood Turnip are three of the best varieties.

Borecole or Kale.—Four varieties tested. Dwarf Green Curled Scotch is the best.

Broccoli.—One variety tested; White Cape which is good.

Brussels Sprouts.—Four varieties tested; Improved Dwarf proved the most satisfactory.

Cabbage.—Fifty-two varieties tested. Early Jersey Wakefield (early, Succession (medium); Late Flat Dutch, Drumhead Savoy, (late); Red Dutch, (red), is a select list of the best varieties of cabbage.

Cauliflowers.—Thirty-one varieties tested.—Extra Early Dwarf Erfurt and Early Snowball, (early); Kronk's Perfection, (medium) and Large Late Algiers are among the best.

Carrots.—Sixteen varieties tested. Chantenay and Guerande or Oxheart are two of the best carrots, but if a good extra early sort is required the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Twenty-nine varieties tested. Golden Self-Blanching, Paris Golden Yellow, Improved White Plume, (early); London Red, White Triumph, (late), are among the best.

Corn.—Thirty-six varieties tested. Early White Cory, Crosby's Early, Henderson's Metropolitan, (early); Perry's Hybrid, Stabler's Early, (medium); Stowell's Evergreen, Country Gentleman, (late.) In planting, the Country Gentleman should not be omitted, as it lenghtens the season very considerably, and is of fine quality.

Cucumbers.—Thirty-three varieties tested. Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling is a good pickling sort.

Egg Plants.—Six varieties tested. New York Improved and Long Purple succeed best.

Lettuce.—Twenty-nine varieties tested. Black Seeded Simpson, New York, (curled); Tennis Ball, Salamander, and Golden Queen, (cabbage); Trianon and Paris White Cos lettuce make a good list.

Melons, Musk.—Nineteen varieties tested. Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type, and Surprise, Bayview and Christiana, of the other types, are all good.

Melons, Water.—Ten varieties tested. New Imperial, Ice Cream, and Phinney's Early, are water melons of excellent quality.

Onions.—Fifty-five varieties tested. Yellow Globe Danvers, and Large Red Wethersfield, are two of the best onions in cultivation.

Parsnips.—Three varieties tested. Hollow Crown and Dobbies Selected are both good sorts.

Parsley.—Eight varieties tested. Double Curled is as good as any.

Peppers.—Fourteen varieties tested. Cayenne, Cardinal, Squash, and Golden Dawn are four of the best.

Pease.—103 varieties tested. Nott's Excelsior, American Wonder, Gradus and Gregory's Surprise, (early); Heroine, Improved Stratagem, and McLean's Advancer, (medium). None of these are tall growing varieties. Juno (dwarf), Telephone, Veitch's Perfection (tall), (late).

Potatoes.—Extra Early: Earliest of all and Burpee's Extra Early (pink and white). Early: Everett and Rochester Rose, (pink), Early Puritan, (white). Medium: Carman No. 1, (white), Empire State, (white). Late: Late Puritan, (white), American Wonder (white), Rural Blush, (pink).

Radishes.—Forty-two varieties tested. Early: Rosy Gem, French Breakfast, Red Rocket. Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Six varieties are being tested. Linnæus and Victoria are the most satisfactory.

Salsify.—Four varieties tested. Long White is the best.

Spinach.—Eight varieties tested. Victoria and Thick-leaved are the best.

Squash.—Twenty-four varieties tested. Early: White Bush Scalloped and Summer Crook Neck. Late: Hubbard.

Tomatoes.—One hundred and three varieties tested. Early:—Earliest of All, Dwarf Champion, and Early Ruby. Main crop:—Brinton's Best, Livingston's Favorite Matchless, and Baltimore Prize Taker.

There are many varieties of this vegetable which are almost equal in excellence and productiveness.

Turnips.—Twenty-four varieties tested. Early:—Extra Early Milan and Red Top Strap Leaf. Swedes:—Champion Purple Top, Skirving Improved.

EXPERIMENTS WITH POTATOES.

This year was not very favourable for potatoes, as the weather was dry throughout most of their growing season and the yield on that account was not so large as usual. In a test of 116 varieties, however, grown under as nearly uniform conditions as possible, the average yield per acre of the whole series was 253 bushels 19 pounds, which is 170 bushels 59 pounds above the average for Ontario for this year, and 138 bushels 19 pounds above the average for the past 17 years. The average of the best twelve was 243 bushels 21 pounds above the average for Ontario, and of the poorest twelve 61 bushels 34 pounds above. The average for Ontario, for 1898, was 84 bushels. This would seem to indicate that the farmers throughout the country are not adopting the best methods of cultivation, or are not growing the most productive varieties. The potatoes were planted this year in the orchard enclosure in sandy loam soil, which was in good condition. This land was ploughed in the autumn of 1897, and again in the spring of 1898, shortly before the time of planting; then disc-harrowed, and finally brought into condition for planting, by the smoothing harrow. The drills were made about 6 inches deep and 2½ feet apart, and the sets, which had, as a rule, three eyes, were of good size and were dropped 1 foot apart, each variety occupying one row 66 feet long. The potatoes were covered with the hand-hoe to insure the most uniform conditions. Just as the vines were coming through the ground, the land was harrowed to kill weeds. The potatoes were cultivated three times throughout the summer, but were not hilled up. They were sprayed once with Paris green alone and five times with Bordeaux mixture and Paris green mixed. The potatoes were planted on May 26th and 27th, and dug on the 6th and 7th October.

Besides the uniform test plots, experiments were conducted to determine the best time of planting, the best depth to plant, the best distance apart in the rows to plant and how the seed should be cut to produce the best crops. Results of tests of this kind vary so much, however, from year to year, and with different varieties, that several seasons trials are necessary before satisfactory data can be obtained.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
Holborn Abundance	Medium	393	48	347	36	46	12	White.
Early White Prize	Good	369	36	294	48	74	48	"
Late Puritan	"	358	36	349	48	8	48	"
Rose No. 9	Medium	354	12	314	36	39	36	Pink.
Empire State	Good	345	24	277	12	68	12	White.
American Wonder	"	338	48	323	24	15	24	"
State of Maine	"	325	36	299	12	26	24	"
Rural Blush	"	325	36	272	48	52	48	Pink.
Northern Spy	Poor	325	36	286	..	39	36	Bright pink.
Seedling No. 7	Medium	321	12	268	24	52	48	"
Rural No. 2	"	319	..	286	..	33	..	"
Carman No. 1	"	316	48	292	36	24	12	White.
Polaris	"	316	48	286	..	30	48	"
Green Mountain	"	314	36	286	..	28	36	"
Seattle	Poor	308	..	255	12	82	48	"
Peerless Junior	Good	308	..	286	..	22	..	"
Rose of the North	....	305	48	275	.	30	48	Pink.
Clay Rose	Poor	303	36	268	24	30	48	"
Lee's Favourite	Good	303	36	259	36	44	..	"
Napoleon	"	303	36	257	24	46	12	"
Burnaby Mammoth	....	301	24	264	..	37	24	Pink and white.
Pride of the Table	Poor	299	12	272	48	26	24	Pink.
Flemish Beauty Seedling	"	299	12	261	48	37	24	Bright pink.
Rochester Rose	Good	297	..	272	48	24	12	Pink.

POTATOES—TEST OF VARIETIES—*Continued.*

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
Rawdon Rose	Good	294	48	233	12	61	36	Pink and white.
Canadian Beauty	"	294	48	253	..	41	48	
Burnaby Seedling	"	294	48	259	36	35	12	Pink and white.
Money Maker	"	294	48	224	24	70	24	White.
American Giant	Medium	290	24	237	36	52	48	"
Record	....	288	12	222	12	66	..	"
Dreer's Standard	Good	288	12	250	48	37	24	"
Early Ohio	"	286	..	224	24	61	36	Pink.
Irish Cobbler	....	279	24	259	36	19	48	White.
Reeve's Rose	....	279	24	242	..	37	24	Pink.
Earliest of All	Good	279	24	209	..	70	24	Pink and white.
Sir Walter Raleigh	....	277	12	255	12	22	..	White.
New Queen	Good	277	12	233	12	44	..	Pink and white.
Early Norther	Medium	277	12	215	36	61	36	Pink.
New Variety No. 1	Poor	275	..	228	48	46	12	White.
Bill Nye	....	275	..	215	36	59	24	"
Maggie Murphy	Medium	272	48	242	..	30	48	Bright pink.
Daisy	Good	270	36	226	36	44	..	Pink and white.
Vick's Extra Early	"	270	36	222	12	48	24	"
Oregon Beauty	....	268	24	242	..	26	24	White.
Bovee	....	266	12	204	36	61	36	Pink and white.
Carman No. 3	Good	266	12	244	12	22	..	White.
Queen of the Valley	Medium	266	12	222	12	44	..	Bright pink
Everett	Good	264	..	231	..	33	..	Pink.
Troy Seedling	Medium	264	..	206	48	57	12	White.
Good News	....	264	..	231	..	33	..	Pink.
Delaware	Good	264	..	239	48	24	12	White.
Dakota Red	Medium	261	48	213	24	48	24	Red.
Honeoye Rose	Good	261	48	244	12	17	36	Pink.
Early Six Weeks	"	261	48	193	36	68	12	"
Irish Daisy	"	259	36	158	24	101	12	White.
Early Rose	"	259	36	189	12	70	24	Pink.
Thorburn	"	259	36	198	..	61	36	Pink and white.
Seedling No. 230	Medium	259	36	215	36	44	..	White.
Crown Jewel	Good	259	36	206	48	52	48	Pink and white.
Pearce's Extra Early	"	257	24	178	12	79	12	Pink.
General Gordon	"	257	24	224	24	33	..	"
Beauty of Hebron	Medium	255	12	202	24	52	48	Pink and white.
White Beauty	Good	255	12	158	24	96	48	White.
Monroe County	Medium	255	12	215	36	39	36	Pink.
Cambridge Russet	....	253	..	231	..	22	..	White.
Vanier	Poor	253	..	220	..	33	..	Red.
Early Sunrise	Good	250	48	206	48	44	..	Pink.
Early Harvest	"	250	48	171	36	79	12	White.
Satisfaction	"	250	48	215	36	35	12	"
Clarke's No. 1	"	248	36	204	36	44	..	Pink.
Chicago Market	Good	248	36	202	24	46	12	Pink.
Ideal	....	248	36	233	12	15	24	"
Wonder of the World	Good	248	36	200	12	48	24	Pink and white.
Columbus	....	244	12	224	24	19	48	"
Hopeful	Medium	239	48	215	36	24	12	White.
Ohio Junior	....	239	48	191	24	48	24	Pink.
Early Puritan	Good	239	48	211	12	28	36	White.
Uncle Sam	....	239	48	198	00	41	48	"
Lizzie's Pride	Good	237	36	145	12	92	24	Pink, red eye.
Blue Cup	Medium	235	24	198	..	37	24	Blue and white.
Reading Giant	Poor	235	24	169	24	66	..	Pink.
Brown's Rot Proof	Medium	233	12	195	48	37	24	"
Early Fortune	....	233	12	187	..	46	12	"
Maule's Thoroughbred	....	228	48	187	..	41	48	"
Stourbridge Glory	Good	228	48	160	36	68	12	White.
Early Gem	Medium	224	56	143	32	81	24	Pink.
Quaker City	....	222	12	198	..	24	12	White.
Table King	Poor	222	12	156	12	66	..	"
White Elephant	....	220	12	193	36	26	24	Pink and white.

POTATOES—TEST OF VARIETIES—*Concluded.*

Name of Variety	Quality.	Total Yield per Acre.		Yield per Acre of Marketable		Yield per Acre of Unmarketable.		Colour.
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
Orphans	Medium	220	..	167	12	52	48	White.
Sharpe's Seedling	Good	220	..	127	36	92	24	Pink and white.
Pearce's Prize Winner	"	215	36	176	..	39	36	Pink.
World's Fair	"	215	36	158	24	57	12	White.
Sutton's Main Crop	"	211	12	156	12	55	..	"
Prize Taker	"	211	12	149	36	61	36	Pink.
Hale's Champion	....	211	12	149	36	61	36	White.
Freeman	Good	209	..	147	24	61	36	"
I. X. L	"	209	..	123	12	85	48	Pink and white.
Victor Rose	Medium	206	48	154	..	52	48	Pink.
Pride of the Market	Good	202	24	184	48	17	36	White.
Great Divide	"	198	..	136	24	61	36	"
McKenzie	"	198	..	149	36	48	24	"
Burpee's Extra Early	"	193	36	132	..	61	36	Pink and white.
Sutton's Abundance	"	182	36	112	12	70	24	White.
Algoma No. 1	"	180	24	136	24	44	..	Pink.
Harbinger	"	167	12	127	36	39	36	Pale pink.
London	Medium	167	12	136	24	30	48	Pink.
Brownell's Winner	Good	165	..	112	12	52	48	Red.
Houlton Rose	....	156	12	136	24	19	48	White.
Fillbasket	....	154	..	140	48	13	12	Bright pink.
Seedling No. 214	Good	154	..	127	36	26	24	White.
Charles Downing	"	151	48	94	36	57	12	"
Lightning Express	....	151	48	140	48	11	..	Pink.
Russell's Seedling	Poor	149	36	99	..	50	36	White.
King of the Roses	....	145	12	105	36	39	36	Pink and white.
White Kidney	....	145	12	88	..	57	12	White.

Every year samples of potatoes are received for test, which are either seedlings not yet named, new named varieties, or varieties for identification. As the quantity received of each of these is usually smaller than that used in the uniform test plots, the comparison of yields between these and the named varieties would not be very conclusive. For this reason, the results of the samples received this year are put in a separate table. Those varieties, also, not yet named which we have had for more than one year, are not included in the uniform test plots, and another table shows the results obtained from them.

POTATOES RECEIVED FOR TEST BEFORE 1898.

Address of Sender.	No. of Sets.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
No address (Smooth White Variety)	66	391	36	378	24	13	12
J. N. Bergeron, Somerset, P.Q	66	365	12	343	12	22	..
H. S. Sabean, New Tusket, N.S	66	292	36	246	24	46	12
R. Edwards, Mohawk, Ont. (No. 3)	66	290	24	215	36	74	48
A. S. Brosseau, Abbotsford, P.Q	66	264	..	242	..	22	..
E. Lortie	66	261	48	209	..	52	48
R. Edwards, Mohawk, Ont. (No. 2)	66	250	48	193	36	57	12
W. J. McCord, Marchurst, Ont	66	213	24	178	12	35	12
D. R. Mackintosh, Pleasant Bay, N.B	66	211	12	99	..	112	12

POTATOES RECEIVED FOR TEST, 1898.

Address of Sender.	No. of Sets.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.	
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Mills Prize	33	413	36	396	..	17	36
No. 2 from A. Perron, St. Hilarion, P.Q	6	290	24	266	12	24	12
Rose of Erin, B. Bergeron, Sherbrooke, P.Q	33	277	12	255	12	22	..
Early Dawn, H. C. Marsh, Muncies, Ind	33	245	1	208	43	36	18
J. K. Darling, Almonte, Ont	33	237	36	198	..	39	36
Early Andes, H. C. Marsh, Muncies, Ind	33	220	..	184	48	35	12
White Giant, B. Bergeron, Sherbrooke, P.Q	16	217	47	190	34	27	13
Seedling, G. A. Doherty, Leamington, Ont	33	211	12	176	..	35	12
Pink Eye, B. Bergeron, Sherbrooke, P.Q	33	189	12	140	48	48	24
No. 1, A. Perron, St. Hilarion, P.Q	10	188	46	..	..	..	.
Champion of the Earlies, M. Buzzoll, Cherry River, P.Q	33	176	..	140	48	35	12
Craig Seedling, J. K. Darling, Almonte, Ont	16	90	44	81	40	9	4

TOMATOES.

There were 103 varieties of tomatoes under test this year, the experiments conducted being to determine the productiveness, earliness and freedom from rot of the different sorts. These were grown under as nearly uniform conditions as possible, so that the results might be more reliable. The seed was sown in hot-beds on the 11th of April; the plants transplanted into strawberry boxes and put into cold frames on the 3rd of May; and transplanted to the field on the 3rd of June. Six plants of each variety were used in the uniform test plots and were planted 4 x 4 feet apart. The early part of the season was dry, and during this period the yield was light, but later on there was a good crop and the total yield was large. In the following table particulars are given regarding the different varieties tested:—

Order of Merit.	Variety.	Date of first Ripe Fruit.		Yield of Ripe Fruit from first three pickings.		Yield of Ripe Fruit from last three pickings.		Total Yield of Ripe Fruit.		Yield per Acre of Ripe Fruit.		Yield per Acre of Green Fruit.		Yield per Acre of Rotten Fruit.	
		1898.		Lbs.	Oz.	Lbs.	Oz.	Lbs.	oz.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	New Golden Queen	Aug.	8..	24	3	116	..	140	3	31	1,610	2	991	..	..
2	Ex. Ey. Advance	"	5..	26	9	103	6	123	15	28	237	3	1,260	..	510
3	Alpha	"	4..	30	8	92	8	123	..	27	1,811	1	1,630	..	..
4	Mikado	"	15..	10	12	110	..	120	12	27	790	1	1,176	..	453
5	Canada Victor	July	30..	17	10	103	..	120	10	27	733	2	1,445	..	..
6	Conference	"	30..	25	12	95	8	121	4	27	1,017	6	705	..	..
7	Earliest Market	"	30..	54	2	63	8	117	10	26	1,372	1	1,176	2	991
8	Comrade	"	26..	15	4	98	8	113	12	25	1,614	4	167	..	..
9	Bright and Early	Aug.	4..	18	5	92	12	111	1	25	395	4	1,075	..	..
10	Freedom	July	30..	9	10	99	8	109	2	24	1,515	8	1,242	..	..
11	Earliest of All	"	26..	35	10	71	8	107	2	24	608	2	537	..	453
12	Atlantic Prize	"	30..	23	7	83	..	106	7	24	296	3	806	..	1,815
13	Conqueror	"	29..	20	7	84	8	104	15	23	1,615	3	1,260	1	808
14	Trophy	Aug.	15..	8	2	94	4	102	6	23	453	1	495	..	..
15	Ex. Ey. Richmond	"	4..	19	6	81	..	100	6	22	1,545	2	537	..	680
16	Early Jersey	July	28..	17	..	80	8	97	8	22	241	4	167	..	..
17	Livingston's Favorite	Aug.	21..	14	12	81	..	95	12	21	1,447	9	150	..	1,588

TOMATOES—*Continued.*

Order of Merit.	Variety.	Date of first Ripe Fruit.	Yield of Ripe Fruit from first three pickings.		Yield of Ripe Fruit from last three pickings.		Total Yield of Ripe Fruit.		Yield per Acre of Ripe Fruit.		Yield per Acre of Green Fruit.		Yield per Acre of Rotten Fruit.	
		1898.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	oz.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
18	Early Ruby	July 29..	27	..	67	..	94	..	21	652	1	1,176	..	1,815
19	Early Bermuda	" 30..	40	10	53	4	93	14	21	595	11	687	..	1,560
20	Bonds Ey. Minnesota	" 27..	32	8	61	4	93	12	21	539	3	806	..	..
21	New Combination	Aug. 4..	16	14	74	..	90	14	20	1,235	4	1,982	..	..
22	Money Maker	July 30..	26	4	63	12	90	..	20	837	1	1,176	1	98
23	Brinton's Best	Aug. 15..	8	11	76	8	85	3	19	654	14	1,040	2	765
24	Democrat	" 4..	2	13	81	8	84	5	19	257	6	251	..	..
25	Autocrat	" 21..	9	4	73	8	83	12	19	2	9	150	..	1,475
26	Faultless Early	July 30..	19	15	62	12	82	11	18	1,519	4	1,982	..	1,106
27	Matchless	Aug. 5 .	5	15	74	12	80	11	18	611	13	771	..	..
28	Mitchell's No. 1	" 10..	5	6	74	..	79	6	18	17	17	1,846	1	268
29	Red & Yellow Pear Shaped	" 4..	7	9	71	..	78	9	17	1,648	6	251	..	..
30	Large Red Perfection	18..	9	7	67	..	76	7	17	683	4	621	..	..
31	Horsford Prelude	" 4..	20	..	54	8	74	8	16	1,804	..	1,815	..	..
32	New Golden Queen	"	3	8	69	8	73	..	16	1,123	7	66	..	1,134
33	Golden Fig	" 4..	14	10	58	..	72	10	16	953	3	1,260	..	..
34	Golden Jubilee	" 21..	3	12	68	12	72	8	16	897	4	1,188	4	621
35	Nicholson	. 4..	16	8	54	..	70	8	15	1,989	4	167	..	453
36	Lorillard	" 4..	20	..	50	4	70	4	15	1,876	4	621	..	..
37	Virginia Corker	" 15..	8	14	60	8	69	6	15	1,479	6	1,159	..	1,702
38	Table Queen	" 4..	8	8	60	8	69	..	15	1,309	9	150	..	453
39	Yellow Peach	" 4..	4	..	64	..	68	..	15	855	10	1,326	..	..
40	Upright Station Tree	" 4..	27	7	40	8	67	15	15	827	1	1,630	1	1,630
41	Ten Ton	" 21..	3	4	64	8	67	12	15	742	13	771	1	1,176
42	Livingston's Stone	" 21..	6	12	61	..	67	12	15	742	7	1,881	..	1,248
43	Fordhook's Fancy	July 30..	18	4	49	..	67	4	15	515	4	621	..	..
44	Livingston's Beauty	Aug. 15..	11	10	55	8	67	2	15	457	9	1,511	1	1,176
45	Baltimore Prize Taker	" 4..	19	8	47	8	67	..	15	401	5	209	1	155
46	Canada	" 4..	6	4	60	8	66	12	15	288	5	1,797	1	1,290
47	Terra Cotta	" 10..	11	12	54	..	65	12	14	1,834	10	1,326	..	..
48	Boston Market	July 30..	12	4	53	..	65	4	14	1,607	6	1,612	1	1,630
49	Potato Leaf	Aug. 15..	6	4	57	..	63	4	14	700	9	1,965	..	1,560
50	May's Favorite	" 15..	4	11	58	8	63	4	14	671	11	234	2	83
51	State Fair	" 4..	10	1	53	..	63	1	14	615	4	1,982	..	453
52	Stone	" 10..	8	4	53	8	61	12	14	19	12	1,864	..	..
53	Golden Queen	" 10..	3	4	58	..	61	4	13	1,792	9	504	..	794
54	Ruby Queen	" 15..	4	9	56	4	60	13	13	1,594	9	150	..	..
55	Royal Red	" 18..	5	14	54	8	60	6	13	1,395	9	150	1	1,176
56	Golden Sunrise	" 15..	4	4	55	12	60	..	13	1,225	9	1,057	1	722
57	Dwarf Golden Champion	" 11..	9	12	50	..	59	12	13	1,111	7	66	..	1,248
58	Maule's New Imperial	" 15..	8	7	51	4	59	11	13	1,083	7	520	2	991
59	Aristocrat (Bruce)	" 15..	10	8	49	..	59	8	13	998	5	890	..	..
60	Vick's Early	" 6..	8	6	50	12	59	2	13	828	5	1,797	..	..
61	Honor Bright	" 4..	14	8	44	8	59	..	13	771	8	789	..	907
62	Mayflower	" 10.	5	..	54	..	59	..	13	771	10	872	..	..
63	Long Keeper	" 6..	10	2	48	..	58	2	13	374	4	1,529	1	949
64	Aristocrat	July 30..	13	2	45	.	58	2	13	374	3	352	..	964
65	Brandywine	Aug. 15..	8	..	50	..	58	..	13	317	11	1,141	1	42
66	Peach	" 15..	7	12	49	8	51	4	12	1,977	9	1,511	..	..
67	Diadem	" 15..	18	15	47	4	56	3	12	1,495	6	251	..	680
68	New Imperial	" 16..	5	3	51	..	56	3	12	1,495	4	1,075	..	..
69	Acme	" 7..	16	8	39	..	55	8	12	1,183	5	1,684	3	1,430
70	Golden Trophy	" 15..	3	14	51	..	54	14	12	899	9	150	2	1,785
71	Waldorf	" 4..	2	..	52	12	54	12	12	843	6	1,141	..	1,049
72	Cheney's Early	" 15..	9	8	44	12	54	4	12	616	4	1,529	1	155
73	Chemin	" 15..	8	7	45	12	54	3	12	588	8	1,796	..	1,021
74	Sutton's Best of All	" 4.	9	9	44	8	54	1	12	531	8	1,796	1	42
75	Novelty	....	4	12	49	..	53	12	12	389	9	1,511	2	1,445
76	Essex Hybrid	Aug. 4..	8	1	45	8	53	9	12	304	5	1,797	1	1,913
77	Cardinal	" 15..	4	..	48	8	52	8	11	1,822	9	150	..	1,475
78	Buckeye State	" 15..	..	..	52	..	52	0	11	1,595	9	1,965	1	496
79	Trophy	" 4..	8	8	43	..	51	8	11	1,368	7	66	1	42

TOMATOES—*Concluded.*

Order of Merit.	Variety.	Date of first Ripe Fruit.	Yield of Ripe Fruit from first three pickings.		Yield of Ripe Fruit from last three pickings.		Total Yield of Ripe Fruit.		Yield per Acre of Ripe Fruit.		Yield per Acre of Green Fruit.		Yield per Acre of Rotten Fruit.	
		1898.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	oz.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
80	Essex Early	July 30..	5	2	45	8	50	10	11	971	9	1,057	1	212
81	General Grant	Aug. 4..	3	1	47	8	50	9	11	942	9	1,965	1	836
82	Large Yellow	" 15..	2	11	46	8	49	3	11	319	14	1,494	2	1,558
83	Matchless	" 21..	4	4	44	4	48	8	11	7	11	234	1	1,290
84	Dwarf Champion	" 5..	10	15	31	12	42	11	9	1,368	4	621	1	694
85	Queen	" 4..	1	9	41	..	42	9	9	1,266	11	234	..	822
86	Royal Red	" 15..	3	11	38	12	42	7	9	1,256	11	1,141	1	297
87	Red Currant	" 4..	..	..	42	..	42	..	9	1,057	..	..	..	..
88	Red Apple	" 21..	2	15	37	8	40	7	9	348	11	1,595	1	98
89	Thorburn's New York	" 16..	7	2	32	12	39	14	9	93	9	1,511	2	1,558
90	Lemon Blush	" 15..	4	6	35	8	39	14	9	92	9	1,057	2	991
91	Michigan	" 10..	7	1	32	..	39	1	8	1,724	6	1,159	1	1,630
92	County Fair	July 30..	11	12	26	8	38	4	8	1,356	4	1,075	..	1,588
93	Beauty	Aug. 19..	1	7	36	..	37	7	8	984	10	1,326	1	1,517
94	World's Fair	" 6..	5	10	31	..	36	10	8	618	6	251	2	83
95	Station Tree	" 21..	..	..	34	8	34	8	7	1,654	4	1,982	..	794
96	Picture Rock	" 15..	8	..	26	..	34	..	7	1,427	9	150	2	310
97	New Jersey	" 16..	3	1	30	8	33	9	7	1,229	9	150	..	227
98	Volunteer	" 4..	4	12	28	..	32	12	7	860	9	1,057	2	1,445
99	Ivory Ball	" 16..	4	6	28	4	32	10	7	803	11	1,595	..	..
100	Fordhook	" 10..	12	4	20	4	32	8	7	747	7	66	2	1,105
101	Climbing	" 18..	2	8	28	12	31	4	7	180	17	485	..	1,135
102	Strawberry or Ground Cherry	....	..	..	29	12	29	12	6	1,499	2	83	..	..
103	Paragon	Aug. 15..	2	..	22	..	24	..	5	890	11	234	1	1,176
104	Ignotum	" 13..	1	4	22	..	23	4	5	549	10	1,326	1	13
105	Burbank Preserving	" 15..	1	15	19	8	21	7	4	1,727	3	1,764	..	..

The six wrinkled varieties which have given the best average yields in three years are :—

	Lbs.	oz.	
Early Bermuda	17	12	per plant.
Extra Early Jersey	17	9	"
Early Richmond	17	6	"
Money Maker	17	2	"
Democrat	16	11	"
Conqueror	16	10	"

The twelve smooth varieties which have given the best average yields in three years are :—

	Lbs.	oz.	
Brinton's Best	17	10	per plant.
Baltimore Prize Taker	16	14	"
Extra Early Advance	16	14	"
Canada Victor	16	12	"
Comrade	16	7	"
Mayflower	16	4	"
Livingston's Favorite	16	2	"
Early Ruby	16	1	"
Cardinal	15	10	"
Atlantic Prize	15	7	"
Thorburn's Long Keeper	15	6	"
Matchless	15	6	"

GARDEN PEASE.

There were 103 varieties of garden pease tested this year, but as a list of 101 varieties was given in the report of the Horticulturist for 1896, with information regarding them, a full list is not published this year. In the following table, however, will be found a list of the earliest 25 varieties tested, with notes as to time of blooming, time when ready for table use, productiveness, quality, etc. The pease were planted on 13th April, in rows 15 feet long, 200 pease of each sort being used. A list of the best varieties covering the whole season will be found in the "List of Best Vegetables for farmers," which appears on page 109 of this report.

TWENTY-FIVE EARLIEST VARIETIES OF PEASE.

Name.	Seedsmen.	Date of Blossoming.	When Ready for Table.	Average number of pease per pod.	Yield of dried pease. Lbs. oz.	Kind of pease, wrinkled or smooth.	Height. Feet.	Quality.
Cleveland's First and Best.	Ewing....	May 29...	June 15...	6	1 7½	S.	3 to 3½..	Good.
Early Frame Improved....	Landreth.	" 30...	" 15...	6	1 12½	S.	3 to 3½..	Medium.
Exonian....	Thorburn.	" 29...	" 16...	6	.. 11	W.	1 to 2...	Very good.
Extra Early Star..........	Ewing....	" 29...	" 16...	3	2 6	S.	3 to 4...	Good.
Thorb. Extra Early Market	Thorburn.	" 29...	" 16...	6	1 6½	S.	3 to 3½..	Medium.
Extra Early Pioneer.......	Dreer	" 29...	" 16...	5	1 1	S.	1 to 2...	"
Tom Thumb..............	Thorburn.	" 30...	" 16...	6	2 1	S.	2½ to 3..	"
Rural New Yorker........	" .	" 30...	" 16...	5	2 1	S.	3 to 4...	"
Gregory's Surprise	" .	" 29...	" 17...	6	.. 7	W.	2 to 3...	Very good.
Bergen Fleetwing.....	Gregory..	" 29...	" 17...	5	2 1½	S.	2 to 2½..	Good.
Daniel O'Rourke Improved	Thorburn.	" 29...	" 17...	7	1 4	S.	2 to 3...	Medium.
Early Kent....	Ewing....	" 29...	" 17. .	5	2 1	W.	3 to 3½..	"
Early Dexter....	Farquhar.	" 29...	" 17...	7	2 7	S.	3 to 3½..	Good.
Early May Improved......	Landreth.	" 29...	" 17...	7	1 15	S.	3 to 4...	"
Hancock..................	Gregory..	" 29...	" 17...	3	2 2½	S.	2 to 3...	"
Station.........	Thorburn.	" 29...	" 17...	6	1 ½	W.	2.......	"
Sunol.......	Gregory..	" 30...	" 17...	3	1 11½	S.	3.......	"
American Wonder....	Thorburn.	" 30...	" 17...	6	1 3½	W.	1 to 1½..	Very good.
Alaska....................	" .	" 30...	" 17...	5	1 7	S.	2 to 2½..	Good.
Extra Early....	Landreth.	" 30...	" 17...	5	1 11	S.	1 to 1½..	"
Evergreen Pod	" ..	" 30...	" 17...	6	.. 8	W.	2 to 3...	"
New Maud S....	Buckbee..	" 30...	" 17...	5	2 7	S.	4 to 4½..	Medium.
Philadelphia..	Thorburn.	" 31...	" 17...	5	1 11	S.	4 to 4½..	"
Gradus (Prosperity)..	Dreer	" 29...	" 18...	7	.. 12	W.	2 to 3½..	Very good.
Alpha....................	Thorburn.	" 29...	" 18...	5	1 ½	W.	4 to 4½..	Good.

NOTE.—Exonian, Gregory's Surprise, Evergreen Pod and Gradus did not germinate well, which accounts, in part, for the small yield of these varieties. Nott's Excelsior, which was ready for use on June 20th, and is one of the best early pease, is deserving of special mention.

TOBACCO.

The testing of different varieties of tobacco was continued this year, 35 sorts being planted. The seed was sown in a hot-bed on the 16th April ; the young plants transplanted into a cold frame on 30th May, and most of them planted in the field on the 13th June.

The tobacco was grown on a sandy loam soil, enriched with a heavy dressing of farm-yard manure and a crop of Lucerne clover, which was ploughed under on the 20th of May. The land was then disc-harrowed. Previous to planting it was disc-harrowed again, and brought into good condition with the smoothing harrow. The tobacco was planted in rows 4 feet apart and 3 feet apart in the rows. Fifteen plants of each variety were set out in uniform test plots, while larger plots were also planted of some

sorts. The soil was cultivated at intervals (four times in all) to kill weeds and preserve moisture, until the plants were too large to admit of the passage of a horse between the rows without injury to the leaves. As the different varieties were not in the same condition at one time, the topping and priming of all could not be done on the same days. The tobacco made very satisfactory growth, and most of the varieties matured sufficiently to be in good condition for cutting on the 9th September, when the plants were cut and taken to the curing house, where, after they were cured, the leaves were stripped off, weighed, and piled for fermentation.

In the following table particulars are given of the date of topping, total weight of first grade dried leaves, weight of second grade dried leaves, weight of third grade dried leaves and estimated total weight per acre of dried leaves :—

Name.	Seedsman.	Date of Topping.	Yield per acre dry leaves, 1st grade.		Yield per acre, dry leaves, 2nd grade.		Yield per acre, dry leaves, 3rd grade.		Total yield per acre dry leaves.	
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Maryland	Evans	August 12	899	9	733	9	211	12	1,844	14
Granville Co. Yellow	Henderson	" 2	787	13	801	10	166	6	1,755	13
Kentucky Burley	Thorburn	" 12	703	5	650	6	393	4	1,746	15
Oronoko Yellow	"	" 2	673	1	771	6	196	10	1,641	1
Tennessee Red	"	" 2	847	..	680	10	105	14	1,633	8
White Stem	Henderson	" 2	654	8	759	4	200	12	1,614	8
Hyco	"	" 2	642	13	718	7	242	..	1,603	4
Yellow Mammoth	Thorburn	" 2	794	1	673	1	128	9	1,595	11
Safrano	"	" 12	741	2	680	10	166	6	1,588	2
Hartford	Evans	" 12	756	4	506	11	294	15	1,557	14
Brazilian American	Thorburn	" 12	801	10	650	6	105	14	1,557	14
Yellow Pryor	"	" 2	711	9	670	5	154	11	1,536	9
Sumatra	"	" 2	400	13	778	15	355	7	1,534	9
Oronoko White Stem	"	" 2	710	14	627	11	166	6	1,504	15
Connecticut Seed Leaf	Evans	" 2	548	4	661	11	217	7	1,427	6
Conqueror	Thorburn	" 2	680	10	589	14	151	4	1,421	12
Hester	Evans	" 2	529	6	582	5	310	1	1,421	12
Gold Leaf	"	" 12	567	3	607	11	218	12	1,393	10
Pennsylvania Seed Leaf	Thorburn	" 12	400	13	635	4	355	7	1,391	8
Virginia One Sucker	"	" 12	536	15	703	5	151	4	1,391	8
Climax	"	" 12	627	11	574	12	189	1	1,391	8
Bradley's Broad Leaf	Chevrier	" 12	736	..	476	7	113	7	1,325	14
White Burley	Evans	" 12	642	13	521	13	158	13	1,323	7
Virginia Oak Hill	Thorburn	" 12	544	8	544	8	196	10	1,285	10
Sterling	Evans	" 12	582	5	552	1	121	..	1,255	6
Honduras	Thorburn	" 2	506	11	582	5	143	11	1,232	11
Sterling	Thorburn	August 12	478	15	567	3	163	1	1,209	3
Zimmer's Spanish	Henderson	July 30	499	2	605	..	98	5	1,202	7
Big Boston	Evans	" 12	597	7	491	9	113	7	1,202	7
Tuckahoe	Thorburn	" 2	468	14	521	13	196	10	1,187	5
Primus	Henderson	" 2	521	13	461	5	181	8	1,164	10
Havana	Thorburn	July 21	211	12	393	4	491	9	1,096	9
Cuban Seed Leaf	Chevrier	August 2	354	8	283	9	382	14	1,020	15
Bullock's Tongue	"	" 12	330	..	391	14	154	11	876	9
Havana	Evans	" 12	198	8	397	..	254	12	850	4
Florida	Henderson	" 12	173	15	211	12	363	..	748	11
Persian Rose	Thorburn	" 2	242	..	181	8	287	6	710	14
Cannelle	Chevrier	July 18	132	8	132	8	190	7	455	7

The Kentucky Burley, White Burley, Yellow Pryor, Yellow Mammoth, Connecticut Seed Leaf, and Pennsylvania Seed Leaf are, taking everything into consideration, probably the most profitable varieties to grow. Some of those which yielded heavier than these were too late in maturing to reach the best condition.

FOREST BELTS.

The work of taking measurements of the growth of the trees in the forest belts has been continued this year. The trees, on the whole, have not made very strong growth, but the white, Scotch, and Austrian pines and European larch have done well. The white pine, especially, which, in some places, is growing on apparently almost pure sand, continues to make a growth of from 2 to 3 feet each year.

Cultivation was continued in those parts of the belts where the trees do not make sufficient shade to prevent the formation of sod or the growth of weeds. The belt planted in the autum of 1894 was cultivated during part of the season, but the trees in the greater part of this belt will not require cultivation in future. Tamarac and canoe and yellow birch, which were pulled up in an adjoining swamp with very few roots, and planted in this belt, have become well established and made good growth this year.

In the mixed forest belt, where the different varieties are intermingled, some of the faster growing trees had begun to exclude the light from those which had not made such rapid growth. A man with a hook was sent through the belt and the obstructing branches cut back, so as to allow the full rays of the sun to reach the leaders of the over-shadowed trees. This, in many cases, saved the pine trees, and in other cases preserved their leaders from destruction. It will be necessary to continue this work from year to year, in order to save the more valuable timber trees and to assist in the formation of tall, straight trunks.

The Russian poplars continued to die from the species of dry rot mentioned in previous reports. The variety known as *Populus alba bolleana*, which makes such a handsome tree, has, during the past two years, become badly affected, and numbers of them have died and are still dying. Each year's experience demonstrates that black walnut will not succeed where there is a cold, wet subsoil. The trees in the forest belts where the soil is of this character are almost at a standstill, while in other places on the farm where they are in warmer soil, they make a growth of from 2 to 4 feet in a season. The black walnut trees planted in 1888 in clay loam soil began to fruit last year, and again had some nuts this year, but the boys got them before they reached maturity.

In order to give some idea of the height and circumference which a few of the best known timber trees reach in a few years when planted on suitable soil, the following figures are given, but for exact measurements and fuller details the reader is referred to my report, as Foreman of Forestry, for 1897.

Name.	When Planted.	Height or Age when Planted.	Approximate Height, 1898.	Circumference, One Foot from Ground, 1898.
			Ft.	Inches.
White Pine—*Pinus Strobus*	1889	8 to 10 inches	18	11½
Scotch Pine—*Pinus sylvestris*	1888	18 inches ...	20	13
Austrian Pine—*Pinus austriaca*	1889	18 " ...	14	13
White Spruce—*Picea alba*	1889	15 " ...	11	8
Norway Spruce—*Picea excelsa*	1888	15 " ...	18	12¼
White Ash—*Fraxinus americana*	1889	3 years	22	8¾
European Larch—*Larix Europæa*	1888	2 feet ...	23	14
Black Walnut—*Juglans nigra*	1888	1 year	14	9
Canoe Birch—*Betula papyracea*	1889	3 feet	27	11
Yellow Birch—*Betula lutea*	1889	3 "	19	10½

ARBORETUM.

The collection of trees, shrubs and perennials has been considerably augmented this year. Of trees and shrubs 314 species and varieties have been added, and of perennials 285 species. There were living in the Arboretum this autumn about 2,700 species and varieties of trees and shrubs, and about 1,200 species and varieties of perennials. This collection, which has been gradually brought together, contains many rare and beautiful species, some of them of peculiar interest to the botanist, and others to the lover of ornamental trees, shrubs and flowers.

PROGRESS OF THE WORK.

During the summer, notes were taken on the hardiness, dates of blooming, and growth of the different species and varieties. A herbarium of the plants growing in the Arboretum is being made, for which 535 specimens were dried and will be mounted this winter. The work of labelling the additions to the Arboretum was also carried on. Last winter an alphabetical list was prepared of all the trees and shrubs growing in the Arboretum, with notes on the hardiness and date of planting of the different species and varieties. It is hoped that this list will shortly be published. There was little increase in the amount of hand labour required to keep the Arboretum in order, the bulk of the work being the cutting of the grass, which is done by the pony lawn mower, and the season being dry it was not cut so often, as it otherwise would have been. A new one-horse field mower was procured this year, which proved very valuable on side hills, and when the grass became too long to be cut well with the pony mower. An additional three acres were seeded down during the summer, on most of which was a good catch of grass this autumn.

ADDITIONAL LIST OF CHOICE HARDY PERENNIALS.

In my report for 1897, a list of 100 of the best hardy perennials was given, with short descriptions of them. There are so many beautiful flowers and so many new ones appearing from time to time, that a few additions to that list are here given, in the hope that it will help others in the selection of choice perennials for their gardens. One correction should be made in the list published last year. The plant at the Experimental Farm which was supposed to be *Campanula Grossekii* is not that species. The true *Grossekii* does not deserve a place in the list of 100 of the best varieties.

Aethionema coridifolia.—Mount Lebanon Candytuft (Orient) : This is a charming little plant about six inches in height. It begins to bloom in the third week of May, and stays in flower from four to six weeks. Flowers, small, bright pinkish lilac, borne profusely in heads. Leaves, narrow and glaucous.

Ajuga genevensis.—Geneva Bugle (Switzerland) : Height, four to six inches. Begins to bloom in the last week of May. The flowers of this pretty dwarf perennial are bright blue, and being a profuse bloomer it presents, when in full bloom, a very attractive appearance.

Asclepias incarnata.—Flesh-coloured Milkweed (Canada) : Height, three to four feet. In bloom, July and August. Flowers, bright purplish red. This fine native wild flower accommodates itself well to the perennial border, and in large collections it should not be omitted.

Helenium grandicephalum striatum.—Large Striped Sneezewort. United States. Height, 3 to 4 feet. In bloom August, September and part of October. Flowers, deep yellow, streaked with brown. This is a very striking and unique looking plant, blooming over a long period.

Campanula latifolia macrantha.—Large Flowered Bell-flower (Europe). Height, 3 to 4 feet. In bloom first week of July. Flowers, large, deep blue, borne on a long spike. A very handsome variety.

Echinacea purpurea.—Purple Cone Flower (United States). Height, 2 to 3 feet. In bloom August and September. Flowers, large, deep reddish-purple, borne singly on long stems. A very fine autumn flower.

Epimedium pinnatum (sulfurum).—Yellow Flowered Barrenwort (Persia). Height, 8 to 12 inches. In bloom second week in May. Flowers, bright yellow, borne in a loose panicle. This species and *E. rubrum* make a charming contrast when planted together. It is one of the most dainty early flowering perennials yet tested.

Group of Arbor-vitae in the Arboretum at the Central Experimental Farm, Ottawa, Ontario.

Group of Pines and Spruces in the Arboretum at the Central Experimental Farm, Ottawa, Ontario.

Heliopsis pitcheriana.—Pitcher's Ox-eye (United States). Height, 3 to 4 feet. Blooms during July, August and September. Flowers, large, deep yellow and very abundant. This is a fine late summer and autumn flowering perennial; its time of bloom covering a long period.

Iris aurea.—Golden Iris: (Himalayas). Height, 3 to 4 feet. In bloom during the first week of July. Flowers, large, deep yellow. One of the most beautiful of all irises. Its lovely colour, stately appearance, and its lateness in blooming make it very desirable.

Iris pallida.—Pale Iris. (South Europe). Height, 2 feet. In bloom, first week of June. Flowers, lilac purple and bright purple. This is a very delicately tinted iris, of which there are some fine varieties.

Polemonium humile pulchellum.—Pretty Dwarf Jacob's Ladder. (Canada, United States. Height, 6 inches. In bloom second week of May. A very pretty free blooming perennial with violet-blue flowers and small, narrow leaves.

Phlox ovata.—Ovate-leaved Phlox. (United States). Height, 12 to 18 inches. In bloom first week of June. Flowers, rich pink. One of the best coloured phloxes tested. It continues in bloom most of the summer, and is very showy.

Trollius Ledebourii.—Ledebour's Globe Flower, (Siberia). Height, 12 to 18 inches. Flowers, large, orange-yellow. This species has deeper coloured flowers than most of the other sorts, and on this account is highly recommended.

REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.C.S.)

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Ottawa, 1st December, 1898.

Sir,—I have the honour to submit herewith the twelfth annual report of the Chemical Division of the Experimental Farms.

The various branches of work reported on by this Division in previous years have again received attention. As far as was practicable, original investigation and chemical work in connection with experiments on the farms have taken priority, but the large amount of work of an urgent nature that has come in from farmers during the past year has obliged us to relinquish, or at least to leave unfinished for the time, much interesting research work that we had undertaken and hoped now to be in a position to report upon. Every year sees an increase in the number of requests for examination of soils, cattle foods and many other matters pertaining to agriculture. The correspondence yearly makes greater demands upon our time. In consequence of all this there is now a considerable number of samples awaiting examination and analysis. It is our hope to attend to these as opportunity permits. Those who have thus sent samples to the laboratory and have not yet received any report, may rest assured that press of work alone has prevented us from making the desired analysis. All samples are duly recorded in a register as received, and are taken in hand, as time allows, in the same order.

All research and analytical work, whether in connection with our experiments or with samples submitted by farmers, is undertaken with the hope of furnishing results of importance and practical value to Canadian agriculture. This object has been kept well in view during the past year, and we feel assured that the information presented in this report, as well as that given by correspondence, will be found of service by farmers in general and those engaged in one or other of the special branches of Canadian husbandry.

The present report may be briefly summarized as follows :—

The Preservation of Manure.—The results of an extensive investigation on this important subject show (1) the relative value, weight for weight, of fresh and rotted manure, (2) the losses that occur during the rotting of "protected" and "exposed" manure, (3) the effect of rotting on the availability of the plant food contained in manure and (4) the effect of adding ground gypsum to fermenting manure. The data and the conclusions drawn from this investigation will undoubtedly prove interesting and valuable to our readers.

Inoculation with nitragin for the growth of legumes.—This work, commenced in 1897, has during the past season been continued. Though the results are not, perhaps, on the whole, so encouraging as those recorded in last year's report, they nevertheless point to the efficacy of this new agent in promoting the growth of clover and other members of the legume family. Further experiments, tried in various parts of the country, will be needed before we can definitely say whether *nitragin* can be used economically in the field.

Forage Plants, Fodders and Feed Stuffs.—Grouped under this heading are to be found results obtained on the following:—

1. The native prairie hays as grown in Manitoba and the North-west Territories. The composition of hays produced on lowlands (principally sedges) as compared with that of uplands, and their relative feeding value considered.

2. The composition of timothy and brome grass hay as grown at Ottawa. Since brome grass of late years has attracted so much attention, both in Ontario and the North-west, the results of these analyses will undoubtedly be of wide interest.

3. Soja beans as a forage crop for the silo. This is practically a new field crop and has been recommended for ensiling with Indian corn to supply nitrogenous matter and thus make the ensilage nearer a "balanced" ration. Analyses are given depicting the composition of the beans grown under different methods of seeding and culture.

4. Oat feed, oat dust, etc., are by-products in the manufacture of oat meal. They have been largely sold of late to dairymen. Our examination of several samples furnishes information as to their nature and feeding value.

5. Molasses refuse from the sugar refinery. This also, in certain parts of Canada has appeared upon the market as a feeding stuff. The analyses made in the farm laboratories clearly define its character and value as a cattle food.

6. Cocoa shells. This is a waste product from the cocoa and chocolate factory and a highly nitrogenous material that may prove of value, locally, as part of the concentrated or meal portion of the ration.

7. Sugar-beets as grown in British Columbia.

Flours.—This work includes a careful analysis and a critical study of the results of representative samples of Canadian and Hungarian flours.

Soils.—Some of the more important soil examinations made during the past year are here reported on, and suggestions (which will prove of value to others having similar soils) for their treatment and improvement have been added.

Fertilizers.—We present data on several samples of swamp muck recently analysed in the laboratories and also furnish information respecting "Thomas or Basic slag" and "South Carolina Rock," two phosphatic fertilizers now largely advertised in Canada.

Well-waters from farm homesteads.—More than one hundred samples have been received for examination during the twelve months ending 30th November, 1898. Of these seventy-five have been submitted to analysis. In connection with the results of these, certain information has been given on the important subject of the farmer's water supply, which we trust will prove of practical value and lead to greater care being taken in preventing pollution of the farm well.

It should be distinctly understood that samples from *farm homesteads only* can be examined. The printed instructions issued by the Farm should be obtained before sending a water for analysis, since the probability is that otherwise a mistake will be made respecting the quantity required or in the matter of collection and shipment.

In connection with the work of this Division the results of which cannot of necessity appear in the report, we have to speak as follows:—

Correspondence.—From November 30th, 1897, to December 1st, 1898, 1,298 letters were received and 1,904 letters were despatched. Since the greater number of letters received contain requests for information on soils, fertilizers, cattle foods, etc., it is scarcely necessary to add that a considerable portion of my time is taken up with this branch of our work.

Tuberculin.—By direction of the Department of Agriculture we have prepared and forwarded to veterinary surgeons throughout the Dominion 595,320 minims or 9,922 doses of diluted tuberculin during the twelve months ending November 30th, 1898. This is practically three times the quantity sent out in 1897. This work has consumed

much time and has now assumed such large proportions that it becomes necessary in the near future to provide special assistance to carry it on, or the purely chemical work of the division must suffer.

Samples received for analysis.—The appended schedule denotes the number and nature of the samples received at the farm's laboratory since our last report.

SAMPLES received from Farmers for Examination and Report, November 30, 1897, to December 1st, 1898.

—	British Columbia.	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	5	......	3	5	9	6	3	.....	31	27
Mucks, mud and marls	1	.....	1	9	3	10	10	16	50	29
Manures and fertilizers	7	1	......	2	2	2	7	2	23	9
Forage plants and fodders	17	10	5	16	......	2	11	2	63	26
Well waters	2	5	8	61	21	2	4	4	107	......
Miscellaneous, including dairy products, fungicides and insecticides	2	6	3	8	6	......	3	5	33	12
	34	22	20	101	41	22	38	29	307	103

As shown above, many of these, for want of opportunity, still await examination. All the waters and samples of a perishable nature have, however, been reported on; the remaining samples, the analysis of which has been necessarily postponed, have been prepared and bottled, so that they can be examined as soon as time permits.

Mineral specimens.—We would again call attention to the fact that it does not come within our province to examine and report upon mineral specimens.

The Assistant Chemist.—In April last, Mr. H. S. Marsh, who had been with us since November, 1894, resigned the post of assistant chemist. The vacancy was filled by the appointment of Mr. A. T. Charron, who entered upon his duties July 1st.

Mr. Charron, who is a graduate of Ottawa University, passed some years ago the Departmental examination qualifying him for the post of Public Analyst in the Dominion, since which time he has had considerable experience in analytial work, both in Ottawa and Montreal. It is with the greatest pleasure that I can bear testimony to Mr Charron's ability and skill as a chemist. He has shown himself a careful and assiduous worker and the lively and intelligent interest he has evinced in the work of the Division has rendered his services of great value. My thanks are due to him for many of the data presented in this report.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

THE PRESERVATION OF BARN-YARD MANURE.

Further investigations into the losses that occur in the rotting of barn-yard manure under different systems of preservation were commenced two years ago.* The analytical work in connection with these experiments was not completed till the early part of the present year, and consequently this is the first opportunity of presenting the results in detail to the farmers of Canada.

THE ROTTING OF MANURE: "PROTECTED" AND "EXPOSED."

Series 1: This experiment consisted in taking two lots of fresh manure, equal in weight and alike in composition, and placing one in a closed shed, the other in an open wooden bin with a practically water-tight floor, both lots being weighed and analysed month by month for the period of a year.

The objects of this investigation, stated briefly, were to ascertain, under the "exposed" and "protected" conditions just described, (1) the losses in plant food (nitrogen, phosphoric acid and potash) that may occur, (2) the changes, as regards availability of the nitrogen, phosphoric acid and potash, that may result, (3) the relative values, weight for weight, of fresh and rotted manures and also of the latter at certain times throughout the fermentation period.

In April, 1896, horse and cow manures, produced at the Experimental Farm, Ottawa, and consisting of the solid and liquid excreta and the litter used in bedding these animals, were taken in equal proportions by weight and thoroughly mixed. Four tons of this resulting manure were placed in a small wooden building which was weather-proof, and a similar amount—four tons—was placed in an open bin constructed with double flooring and sides. The manure, both in the building and in the bin (designated in this report as "protected" and "exposed", respectively) was kept as compact as practicable throughout the experiment, care being taken after each weighing and sampling, to render the manure as close and dense as might be possible by tramping and pounding.

As already stated, samples of each of the manures were taken monthly, the total weights at these periods being also ascertained. The initial and subsequent samplings were done carefully and with thoroughness, and all precautions taken to obtain for analysis representative portions.

Notes on the appearance of the manures were made monthly at the times when the samples were taken. These serve to indicate the degree to which fermentation or decomposition had advanced, at the several periods; in other words, the condition or character of the manures as fermentation proceeded.

The analysis consisted in determining (1) moisture, (2) organic or vegetable matter, (3) ash or mineral constituents, (4) total nitrogen, (5) nitrogen present as ammonia and in nitrates and nitrites, (6) total phosphoric acid, (7) available phosphoric acid, (8) total potash, (9) available potash. The amounts of "total" phosphoric acid and potash obtained were those dissolved out of the manure by hot strong hydrochloric acid (sp. gr. 1·115) at the temperature of boiling water; the amounts of these constituents designated as "available" were obtained by treatment with dilute citric acid (1 per cent) in the cold. We may suppose that the nitrogen present as ammonia, nitrates and nitrites, and the phosphoric acid and potash soluble in dilute citric acid, to be more or less immediately available to plants. The value of these estimations as a means of tracing the conversion of the plant food into assimilable forms will, therefore, be apparent.†

---

* The results of previous experiments in the preservation of barn-yard manure are published in the Report of the Experimental Farms for 1895 and 1896.

†Dr. Bernard Dyer, in 1894, showed that the sap and exudations of rootlets had a solvent action approximately equivalent to that of 1 per cent citric acid solution, and this was therefore the solvent used in the determination of the amounts of "available" fertilizing constituents present.

The composition of the fresh manure experimented with, as revealed by the initial analysis, was as follows:—

	Per cent.
Water	68·61
Organic matter	24·23
Ash or mineral constituents	7·16
	100·00
Total nitrogen	·601
Nitrogen, as ammonia, nitrates and nitrites	·083
Total phosphoric acid	·31
Available phosphoric acid	·19
Potash	·76
Available potash	·68

It will be instructive in passing to compare this manure with that ordinarily produced throughout the country. As regards nitrogen, it is considerably richer than that usually met with, chiefly due no doubt to the fact that greater care is exercised on the Experimental Farm than on the majority of farms in retaining and preserving the liquid portion, and, secondarily, to the liberal diet fed on the Experimental Farm. The manure experimented with is also much above the average in phosphoric acid and potash. These facts are set forth in the following table:—

COMPOSITION OF FRESH MANURE.

Constituents.	Experimental Farm.	Average obtained from other samples.
	Lbs. per Ton.	Lbs. per Ton.
Nitrogen	12·0	7·8
Phosphoric acid	6·2	3·1
Potash	15 2	9·0

THE AVAILABILITY OF THE PLANT FOOD IN FRESH MANURE.

The data on this point are of great interest; a consideration of the foregoing analysis allows us to draw the following important conclusions,

Of the total nitrogen present, 13·8 per cent was as ammonia or in the oxidized form of nitrates or nitrites—compounds of nitrogen that may be utilized more or less directly by the growing plant. In manure that is absolutely fresh, that is, just produced, there is no ammonia and no nitrogen in the form of nitrites and nitrates. The manure which in these experiments we designate as fresh had been accumulating about ten days before the experiment began, and consequently the first stages of fermentation had set in. As a result of this fermentation, these assimilable compounds of nitrogen (representing 13·8 per cent of the total nitrogen) had been formed. Calculated per ton of manure, we have, then, 12 lbs. of total nitrogen, about one and a half pounds of which is immediately assimilable.

Of the total phosphoric acid, 61·3 per cent may be regarded as available. The amount of this element per ton of manure is 6·2 pounds, of which 3·8 pounds is available.

Of the total potash present, no less than 89·5 per cent is soluble. The manure contained 15·2 pounds per ton, of which 13·6 pounds were, we may suppose, immediately assimilable.

NOTE.—The fact that approximately 60 per cent of the phosphoric acid and 90 per cent of the potash in, comparatively speaking, fresh manure are assimilable by crops, is one worthy of remark. In arriving at this we have necessarily assumed Dr. Bernard Dyer's conclusion, already referred to, as correct.

THE CONDITION OF THE PROTECTED AND EXPOSED MANURES AT VARIOUS PERIODS THROUGHOUT THE EXPERIMENT.

The following notes were made when the manures were weighed and samples taken for analysis, monthly, for the period of a year. Both manures rapidly decreased in weight during the first three months, but more especially during the first month of fermentation. From the third month on there was, under the conditions of the experiment, but little decrease in weight of the "Protected" manure, and in the case of the "Exposed" manure the fluctuations in weight after the third month, were principally due to rainfall and evaporation. The total weights of the manures at the periods mentioned are recorded in the first column of table II.

At the end of one month.—Protected manure: quite hot and steaming; considerably "shorter" than at beginning of experiment, but not fully rotted; mould showing in upper six inches of manure.

Exposed manure: not so "short" as protected manure, straw being longer; mould more apparent than in protected manure and showing more or less all through the mass.

At the end of two months.—Protected manure: slightly warm in lower layers; somewhat "shorter", drier and more mouldy than in month previous.

Exposed manure: not quite so dry or so mouldy as protected manure; fairly rotted. (*Vide* foot note.)

At the end of three months: Protected manure; well rotted, short and mouldy; very dry all through. Exposed manure: thoroughly rotted; appears to be in excellent condition; short and quite damp, owing to heavy rains during the previous month.

From this period on, no great differences were to be noticed, though notes taken at the samplings and weighings show that both manures became gradually more homogeneous. For all practical purposes, however, three months, under the conditions of this investigation, were quite sufficient to thoroughly rot the manures, and judging from appearances no benefit was to be derived from fermenting for a longer period. The exposed manure necessarily varied in wetness, according to the rainfall of the preceding month; the protected manure became more and more dry and crumbly. Since the losses of rotted manure by leaching are greater than those of fresh manure, the folly of fermenting manure in exposed piles throughout the greater part of the year, as is the custom with some, becomes apparent.

COMPOSITION OF FRESH AND ROTTED MANURES: PROTECTED AND EXPOSED.

Data representing the percentage composition of the manures taken at twelve stages throughout the experiment are presented in table I. Those of the original manure have already been discussed. We may now consider the composition of the manures and the changes that occur in the condition of the elements of plant food, as rotting proceeds. The losses that necessarily ensue will be spoken of when explaining the results set forth in tables IV and V.

NOTE.—The analytical data for the manure samples of this date are, unfortunately, incomplete, the fire that occurred in the laboratories destroying the samples and many of the results, as the work was in progress.

Building and open bin used in manure preservation experiments. Men engaged in sampling and weighing manure.

TABLE I.

PERCENTAGE COMPOSITION OF FRESH AND ROTTED MANURES, PROTECTED AND EXPOSED.

Manure. (Horse and cow manure in equal parts.)	Water.	Organic Matter.	Mineral Matter or Ash.	Nitrogen. Total.	Nitrogen. As Ammonia Nitrates and Nitrites	Phosphoric Acid. Total. — (Soluble in hydrochloric acid).	Phosphoric Acid. Available. — (Soluble in 1 p.c. citric acid.)	Potash. Total. — (Soluble in hydrochloric acid.)	Potash. Available. — (Soluble in 1 p.c. citric acid.)
Protected.									
1896—April 29th, fresh ..	68·61	24·23	7·16	·601	·083	·31	·19	·76	·68
May 29th.........	61·04	28·90	10·06	·836	·094	·48	·43	1·26	1·12
June 29th	58·52	27·52	13·96	....	·071	.. .	....	....	....
July 29th.........	51·33	29·51	19·16	1·33	·053	·83	·67	2·19	2·06
August 29th......	49·24	31·63	19·13	1·48	·061	·97	·63	2·29	2·00
September 29th...	48·39	32·19	19·42	1·51	·099	1·02	·74	2·41	2 19
October 29th......	42·90	34·43	22·67	1·70	·107	1·12	·81	2·53	2·22
November 29th ...	43·44	33·12	22·44	1·63	·087	1·04	·78	2·67	2·43
December 29th	43·04	34·15	22·81	1·71	·108	1·13	·86	2·75	2·57
1897—January 29th	42·90	34·14	22·96	1·64	·030	1·13	·97	2·71	2·53
February 28th....	41·25	35·02	23·73	1·77	·154	1·17	·85	2·89	2·60
March 29th.......	42·89	34·95	22·16	1·74	·120	1·08	·82	2·75	2·44
April 29th........	41·71	35·42	22·87	1·72	·120	1·08	·86	2·76	2·52
Exposed.									
1896—April 29th, fresh..	68·61	24·23	7·16	·601	·083	·31	·19	·76	·68
May 29th.........	64·69	21·38	13·93	·703	·025	·39	·24	·80	·80
June 29th	60·96	23·88	15·16	....	·052	....	....	....	....
July 29th.........	62·70	20·27	17·03	·869	·035	·58	·39	1·23	1·16
August 29th......	63·18	18·37	18·45	·776	·029	·51	·37	1·20	1·10
September 29th ...	67·23	16·49	16·28	·786	·040	·57	·31	1·19	·97
October 29th......	66·90	15·71	17·39	·803	·038	·54	·36	1·07	1·02
November 29th....	69·25	15·88	14·87	·730	·036	·48	·39	1·05	·91
December 29th	70·14	15·07	14·79	·715	·027	·52	·34	·90	·79
1897—January 29th	69·21	15·46	15·33	·701	·038	·51	·41	·97	·92
February 29th....	68·98	15·08	15·94	·777	·042	·53	·36	1·03	·91
March 29th.......	70·45	14·74	14·81	·746	·033	·49	·36	1·08	·96
April 29th........	66·55	15·82	17·63	·802	·032	·56	·43	·96	·92

NITROGEN.

Protected manure.—At the end of one month the percentage of nitrogen was ·836, as against ·601 in the fresh manure; in other words, weight for weight, the rotted manure contained one-third more nitrogen than the fresh manure. At the end of three months the nitrogen in the rotted manure was, weight for weight of the manures, slightly more than double that in the original. At the close of the experiment, the nitrogen in the rotted manure was, for equal weights of the manures, somewhat more than two and a half times that in the original fresh manure.

The immediately assimilable nitrogen represented by ammonia, nitrates and nitrites, somewhat contrary to expectation, did not increase in the same ratio or in the regular way, as did the total nitrogen, just discussed. Indeed, our results show not only great fluctuations, but frequently that there was a less percentage of nitrogen in these forms as rotting proceeded, than was present in the original manure.

Exposed manure.—As with the protected manure, the percentage of nitrogen increases, so that the fermented manure, weight for weight, is richer in this constituent than the original fresh manure. The ratio of increase is, however, *very much less*, in

part due to the fact that the exposed manure contained more water than that protected, but in part due to a greater loss of nitrogen. At the end of one month the manure contained, weight for weight, one-sixth more nitrogen; at the end of three months, one-third more nitrogen than the original. At the close of the experiment this latter proportion had not materially changed.

In available nitrogen, the amount, though fluctuating, is seldom as large as that in the protected manure. Approximately, the exposed sample contains but one-third to one-fourth that in the protected.

ORGANIC MATTER.

Though not a direct form of plant food, organic matter, as is made clear in Bulletin No. 31 of the Farm series, is a most important and valuable constituent of manure. It is desirable, therefore, that the percentages contained in manures rotted under different conditions should be known.

Protected Manure.—Throughout the experiment the percentage of organic matter steadily increased, and at the expiration of the twelve months, was half as much more as it was at the outset. The original fresh manure contained 24·23 per cent, the manure one year old contained 35·42 per cent.

Exposed Manure.—The percentage of organic matter in the exposed manure steadily decreased, so that at the end of the investigation is was but slightly more than one-half of the percentage contained in the fresh manure. The figures are 24·23 per cent in the fresh and 15·82 per cent in the manure one year old.

PHOSPHORIC ACID.

Protected Manure.—Speaking in round numbers, the phosphoric acid increased in percentage fourfold during the year's rotting; stated otherwise, weight for weight, the rotted manure contains four times as much phosphoric acid as the original.

For every 100 pounds of phosphoric acid present there were 61 pounds available in the fresh manure and 80 pounds so available in the rotted manure at the end of the experiment.

Exposed Manure.—Manure rotted under the exposed condition possessed about double the amount of the phosphoric acid contained in the fresh manure.

Its available phosphoric acid was just half that of the rotted "protected" manure; thus, the "protected" manure contained 1·08 per cent of phosphoric acid at the close of the investigation, the "exposed" contained but ·56 per cent.

POTASH.

Protected Manure,—In the fresh manure, about 90 per cent of this fertilizing constituent may be considered as assimilable. During rotting the total potash increased from ·76 per cent to 2·76 per cent, and the available from ·68 per cent to 2·52 per cent. According to the results obtained in this investigation, fermentation has practically no effect on the availability of the potash compound.

Exposed Manure.—The potash in this manure has increased from ·76 per cent to 1·23 per cent at the end of three months, but at the expiration of twelve months this was found to be reduced to ·96 per cent. This shows an increase only of about one-third, comparing the first and last samples of manure, weight for weight.

Similarly the amount of available potash was approximately only one-third greater at the end than at the beginning of the experiment, the figures being ·68 per cent and ·92 per cent respectively. As in the case of the "total" potash, the percentage of "available" was somewhat greater at the end of three months than at the expiration of twelve months.

The foregoing remarks only outline the composition of these manures and the changes that occurred as rotting proceeded, but they will be sufficient to guide the reader

in the study of the data presented in table I. These results will well repay careful perusal, since they make clear the value, *weight for weight*, of manures rotted under these two conditions of protection and exposure. (*Vide* foot note).

It should be borne constantly in mind, that in the study of the facts revealed by table I., we are not considering the losses in plant food that have followed fermentation. We are simply comparing the percentage composition of manures rotted under different systems; that is, comparing their values, weight for weight. The losses that have ensued under the two systems of rotting will be treated of subsequently.

Since many may be able to more clearly comprehend the facts set forth in table I., if presented in pounds per ton, and a pecuniary value assigned, the following table has been constructed. Nitrogen has been valued at 12c. per pound, phosphoric acid at 5¼c. per pound, and potash at 5½c. per pound, the average price as paid for these elements of fertility in commercial fertilizers. No regard, in these valuations, has been paid to the proportions of the phosphoric acid and potash classed in the table as assimilable, though, of course, we must suppose the available phosphoric acid, for instance, to be of greater agricultural worth than that not so immediately assimilable:—

TABLE II.

POUNDS AND VALUE PER TON OF CHIEF FERTILIZING CONSTITUENTS IN PROTECTED AND EXPOSED MANURE AT THE DIFFERENT PERIODS DURING ROTTING.

MANURE. (Horse and cow manure in equal parts.)	Organic matter.	Mineral matter or ash.	Nitrogen.	Phosphoric Acid. Total.	Phosphoric Acid. Available.	Potash. Total.	Potash. Available.	Value.
Protected.								$ cts.
1896—April, 29, Fresh	485	143	12·0	6·2	3·8	15·2	13·6	2 61
May 29	578	201	16·7	9·6	8·6	25·2	22·4	3 90
June 29	550	279	......	......	......	......	......	......
July 29	590	383	26·6	16·6	13·4	43·8	41·2	6 47
August 29	633	383	29·6	19·4	12·6	45·8	40·0	7 09
September 29	644	388	30·2	20·4	14·8	48·2	43·8	7 34
October 29	689	453	34·0	22·4	16·2	50·6	44·4	8 04
November 29	662	449	32·6	20·8	15·6	53·4	48·6	7 94
December 29	683	456	34·2	22·6	17·2	55·0	51·4	8 32
1897—January 29	683	459	32·8	22·6	19·4	54·2	50·6	8 11
February 29	700	474	35·4	23·4	17·0	57·8	52·0	8 66
March 29	699	444	34·8	21·6	16·4	55·0	48·8	8 34
April 29	708	457	34·4	21·6	17·2	55·2	50·4	8 30
Exposed.								
1896—April 29 Fresh	485	143	12·0	6·2	3.8	15·2	13·6	2 61
May 29	428	279	14·1	7·8	4·8	16·0	16·0	2 98
June 29	478	303	......	......	......	......	......	......
July 29	405	340	17·4	11·6	7·8	24·6	23·2	4 05
August 29	367	369	15·5	10·2	7·4	24·0	22·0	3 72
September, 29	340	326	15·7	11·4	6·2	23·8	19·4	3 79
October 29	314	348	16·1	10·8	7·2	21·4	20·4	3 68
November 29	317	297	14·6	9·6	7·8	21·0	18·2	3 41
December 29	301	296	14·3	10·4	6·8	18·0	15·8	3 26
1897—January 29	309	307	14·0	10·2	8·2	19·4	18·4	3 29
February 29	302	319	15·5	10·6	7·2	20·6	18·2	3 55
March 29,	295	296	14·9	9·8	7·2	21·6	19·2	3 49
April 29	352	352	16·0	11·2	8·6	19·2	18·4	3 57

NOTE.—It is important here to point out that even the "exposed" manure of this investigation, was rotted under conditions much more favourable than those usually and ordinarily existing on the average faam. We therefore feel justified in saying that greater losses of plant food occur in rotting manure generally throughout Canada, than are indicated by the results of this investigation; in other words, the average rotted manures of Canadian farms is much poorer in plant food than the "exposed" manure of our experiment.

In the foregoing tables (I. and II.), the composition of the manures is represented as they were at the end of each month throughout the experiment. In the case of the "exposed" manure, especially, the percentage of water present necessarily varied from month to month. This fact in part accounts for certain apparent discrepancies in the results. Thus, one ton of the exposed manure is said to contain on 29th January, 309 lbs. of organic matter, whereas, for the month previous, and that following, the amounts are stated at 301 and 302 pounds, respectively. These fluctuations, as already remarked, are caused largely by the varying water content, but it is only right to add, not wholly so. The difficulty in obtaining a thoroughly representative sample for analysis from such large masses of wet material, consisting of dung, litter, &c., is very great. There are also the necessary errors of weighing the manures and of analysis. The weighings of the manures, the sampling and the analysis were, however, all done with the greatest care, and, indeed, the general agreement of the data prove that such has been the case. These remarks necessarily apply also to tables III. and IV.

In order to trace more clearly the effect of rotting these manures under the different systems employed, we may eliminate by calculation the water, which we have observed varied from month to month, and compare the amounts of the chief fertilizing elements present as if the manures were in a water-free condition, Table III., series I., contains such data.

TABLE III.

COMPOSITION of DRY MATTER *i.e.*, WATER-FREE MANURE.

MANURE. — (Horse and cow manure in equal parts.)	Organic Matter.	Mineral Matter or Ash.	NITROGEN.		PHOSPHORIC ACID.		POTASH.	
			Total.	As Ammonia, Nitrates and Nitrites.	Total (Soluble in hydrochloric acid).	Available (Soluble in 1 p. c. citric acid).	Total (Soluble in hydrochloric acid).	Available (Soluble in 1 p. c. citric acid).
Protected.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1896—April 29th, original, fresh..	77·2	22·8	1·9	·26	·9	·6	2·4	2·1
May 29th	74·2	25·8	2·1	·24	1·2	1·1	3·2	2·9
June 29th	66·4	33·6	....	·17	....	....	....	....
July 29th	60·7	39·3	2·7	·11	1·7	1·3	4·5	4·2
August 29th	60·4	39·6	2·8	·12	1·9	1·2	4·5	4·0
September 29th	60·4	39·6	2·9	·19	2·0	1·4	4·6	4·2
October 29th	60·0	40·0	3·0	·20	2·9	1·4	4·3	3·8
November 29th	59 6	40·4	2·9	·16	1·9	1·4	4·8	4·3
December 29th	60·0	40·0	3·0	·19	2·0	1·5	4·8	4·5
1897—January 28th	60·0	40·0	2·9	·06	2·0	1·6	4·7	4·4
February 28th	59·6	40·4	3·0	·26	2·0	1·4	4·9	4·4
March 28th	61·2	38·8	3·0	·21	1·9	1·4	4·8	4·3
April 28th	60·8	39·2	2·9	·20	1·8	1·5	4·7	4·3
Exposed.								
1896—April 28th, original, fresh..	77·2	22·8	1·9	·26	·9	·6	2·4	2·1
May 29th	60·6	39·4	2·0	·07	1·1	·7	2·3	2·3
June 29th	61·0	39·0	....	·13	....	....	....	....
July 29th	54·1	45·9	2·3	·09	1·5	1·0	3·3	3·1
August 29th	49·9	50·1	2·4	·09	1·6	1·1	3·7	3·4
September 29th	50·0	50·0	2·4	·12	1·7	1·0	3·7	2·9
October 29th	47·5	52·5	2·4	·11	1·6	1·1	3·2	3·0
November 29th	48·6	51·4	2·4	·12	1·6	1·3	3·3	3·0
December 29th	48·2	51·8	2·4	09	1·7	1·1	3·0	2·6
1897—January 29th	50·0	50·0	2·3	·12	1·7	1·3	3·2	3·0
February 28th	49·6	51·4	2·5	·13	1·7	1·2	3·3	3·0
March 29th	49·9	50·1	2·5	·11	1·7	1·2	3·6	3·2
April 29th	50·2	49·8	2·4	·08	1·6	1·2	2·8	2·6

Without discussing at any length these data, we may point out that it is apparent that very little, if any, advantage is to be obtained from rotting manure for a longer period than three months, even under the best conditions. The chief fermentation changes, which render more available the manurial constituents and "break-down" the organic matter, have by this time accomplished their work. The manure rotted under exposure continues to get poorer and poorer, especially in organic matter and potash. The protected manure remains practically constant in composition after the third month. The greatest changes due to fermentation (not to leaching) are seen to take place during the first month of rotting.

THE LOSSES THAT OCCUR IN ROTTING "EXPOSED" AND "PROTECTED" MANURE.

By far the more important deductions of this investigation are those relating to the losses that occur under the two systems of preservation used in this experiment, and the effect of rotting upon the availability of the elements of fertility. Table IV., contains in the first column the weights of the manures at the several dates when the samples were taken for analysis. The figures in the columns following have been obtained by multiplying these weights by the percentages of the constituents found by analysis at the dates indicated (see table I.). They consequently represent the amounts of the fertilizing ingredients in the whole mass of the manures at these periods. The last column gives the total value of the nitrogen, phosphoric acid and potash present.*

The importance of these data merits their careful consideration.

TABLE IV.

AMOUNTS AND VALUES OF FERTILIZING CONSTITUENTS IN FRESH AND ROTTED MANURES.

MANURE. — (Horse and cow manure in equal parts.)	Total Weight of Manure.	Organic Matter.	NITROGEN.		PHOSPHORIC ACID.		POTASH.		Total Value of Fertilizing Constituents in Manures on dates specified.
			Total.	As Ammonia, Nitrates and Nitrites.	Total (Soluble in hydrochloric acid).	Available (Soluble in 1 p.c. citric acid).	Total (Soluble in hydrochloric acid.)	Available (Soluble in 1 p. c. citric acid).	
Protected.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.
1896—April 29th, original, fresh......	8,000	1938·4	48·1	6·6	24·8	15·2	61·2	54·4	10 43
May 29th	5,006	1446·7	41·9	4·7	24·3	22·0	63·0	56·0	9 76
June 29th	3,451	949·7	......	2·5	.....	.....	.....	......	....
July 29th..................	2,980	879·4	39 6	1·6	24·7	20·0	65·2	61·4	9 63
August 29th..............	2,452	775·5	36·3	1·5	23·9	15·4	56·3	49·0	8 70
September 29th..............	2,391	769·6	36·1	2·4	24·4	17·6	57·7	52·3	8 78
October 29th	2,308	802·9	39·6	2·5	26·1	18·9	59·0	51·8	9 36
November 29th..............	2,298	784·1	37·4	2·0	23·9	17·9	61·3	55·8	9 11
December 29th	2,254	777·8	38·5	2·4	25·4	19·4	61·9	57·9	9 35
1897—January 29th..............	2,224	759·3	36·5	0·7	25·1	21·5	60·2	56·3	9 01
February 28th	2,208	773·0	39·0	3·4	25·8	18·8	61·8	57·4	9 43
March 29th..................	2,207	771·3	38·5	2·6	23·8	18·1	60·7	53·9	9 20
April 29th....................	2,185	773·9	37·6	2·6	23·4	18·7	60·3	55·0	9 05
Exposed.									
1896—April 29th, original, fresh.	8,000	1938·4	48·1	6·6	24·8	15·2	61·2	54·4	10 43
May 29th	5,113	1093·1	35·9	1·3	19·9	12·2	40·9	40·9	7 59
June 29th	4,124	984·8	.	2·1	......	.....	.....	.....	....
July 29th....................	3,903	791·1	33·9	1·3	22·4	15·2	47·6	45·2	7 86
August 29th..................	3,568	655·4	27·7	1·0	18·2	13·2	42·8	39·2	6 53
September 29th..............	4,310	710·0	33·8	1·7	24·5	13·3	51·3	41·8	8 77
October 29th	4,124	651·9	33·1	1·6	22·2	14·8	44·1	42·0	7 56
November 29th..............	4,194	666·0	30·6	1·5	20·1	16·3	44·0	38·2	7 15
December 29th	4,097	617·4	29·3	1·1	21·3	13·9	38·0	32·4	6 73
1897—January 29th................	4,189	647·6	29 3	1·6	21·2	17·1	40·5	38·4	6 85
February 28th................	4,097	617·8	31·8	1·7	21·6	14·7	41·8	37·3	7 24
March 28th........	4,145	610·9	30·9	1·3	20·3	14·9	44·7	39·8	8 13
April 29th.............. ..	3,838	607·2	30·7	1·3	21·5	16·5	36·8	35·3	6 65

*NOTE.—In calculating the pecuniary values we have not taken into consideration the amounts of phosphoric acid and potash that are available, but simply calculated from the "totals" of these constituents present. Were we to assign higher values to the former than to the latter, which we should be quite justified in doing, the differences in value, in favour of the protected manure, would be much greater than those stated in the table.

Organic matter.—In the protected manure the total amount of organic matter was reduced from 1,938 pounds to 774 pounds; in the exposed manure, from 1,938 pounds to 607 pounds.

Nitrogen.—The loss in nitrogen from the protected manure was 10·5 pounds; that from the exposed manure, 17·4 pounds. This means that the former lost practically one-fifth of its nitrogen, while the latter lost something more than one-third.

Phosphoric Acid.—In the protected manure there was virtually no loss of this constituent. Rotting had increased the amount of available phosphoric acid 3½ lbs.

In the exposed manure there was a loss of 3½ lbs. in total phosphoric acid, while of the available phosphoric acid there was only 1 lb. more at the end of the experiment than at the beginning.

Potash.—The total and available potash in the protected manure remained practically constant throughout. There was but little loss, if any.

In the exposed manure. there was a loss of 24½ lbs. of potash (two-fifths of the potash originally present), and the available potash was 21 lbs. less than in the fresh manure.

From the facts represented in table IV., the following percentages of loss have been calculated.

TABLE V.

Loss of Fertilizing Constituents in the Rotting of Manure.

Loss of Fertilizing Constituents.	At the end of 3 months.		At the end of 6 months.		At the end of 9 months.		At the end of 12 months.	
	Protected.	Exposed.	Protected.	Exposed.	Protected.	Exposed.	Protected.	Exposed.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Loss of organic matter....	55	60	58	65	60	67	60	69
" nitrogen.................	17	29	19	30	23	40	23	40
" phosphoric acid	None.	8	None.	12	None.	16	4 (?)	16
" potash	None.	22	3	29	3	34	3	36
Loss in value per ton of original manure.............	20 cts.	64 cts.	27 cts.	80 cts.	36 cts.	90 cts.	36 cts.	95 cts.

Value of fresh manure $2.61 per ton.

In concluding the discussion on the results obtained in this investigation, we may sum up briefly as follows :—

1. That there is a greater loss of nitrogen and organic matter from the exposed manure than from that protected. The former lost one third of its nitrogen, the latter about one-fifth. Ten per cent more organic matter was destroyed in the exposed than in the protected manure.

2. That there is practically no loss of potash and phosphoric acid from the protected manure.

3. That the exposed rotting manure lost about one-sixth of its phosphoric acid and somewhat more than one-third of its potash.

4. The chief changes, due to fermentation, take place within the first months of rotting, and as far as this experiment goes there is no apparent benefit in rotting for a longer period than three months.

The benefits of rotting manure may be summarized as follows :—

The manure becomes disintegrated and of uniform character throughout, resulting in easier and more uniform distribution in the field and allowing a more intimate mixing with the soil ; the coarse litter is decomposed and its plant food thus made more available ; compounds are formed from the organic matter that more readily produce humus within the soil ; the availability of the nitogen of the solid portion of the manure is increased ; the phosphates are made more assimilable ; there is less weight of manure to haul to the fields ; the larger number of weed seeds that may be present are destroyed.

We may again be permitted to call the attention of the reader to the fact—since it is an important point—that the conditions under which manure is kept ordinarily in barnyards are such as would lead to a much greater loss of fertilizing constituents, both from excessive fermentation and leaching, than resulted even from the "exposed" manure of this investigation.

THE PRESERVATION OF MANURE WITH GYPSUM.

This investigation was undertaken with the view of ascertaining the effect of ground gypsum in retaining the nitrogen of fermenting manure in the pile. Three tons of horse and cow manure, mixed in equal proportions, were allowed to ferment without the addition of any preservative, and an equal weight of the same manure was mixed intimately with ground gypsum or land plaster at the rate of 50 pounds per ton of manure. These lots were fermented at the same time in separate bins inside the small building used in the previous experiment (see illustration). The manures were placed in the building on 15th July, being then fresh, made as compact as possible and not stirred or otherwise disturbed till the close of the experiment, 15th November, when they were again weighed and samples taken for analysis. From time to time both lots of manures were moistened. Both manures, therefore, were, with the exception of the presence of gypsum in the one, rotted under the same conditions.

The results of our analysis of the fresh manure and the same manure rotted alone and with gypsum after four months are preented in Table VI. At the time when the final samples were taken, both manures appeared to be thoroughly rotted.

TABLE VI.

PERCENTAGE COMPOSITION OF MANURES ROTTED WITH AND WITHOUT GYPSUM.

MANURE. (Horse and cow manure in equal parts).	Water.	Organic Matter.	Mineral Matter or Ash.	NITROGEN.		PHOSPHORIC ACID.		POTASH.	
				Total.	As Ammonia Nitrates and Nitrites.	Total (Soluble in hydrochloric acid)	Available (Soluble in 1 p.c. citric acid).	Total (Soluble in hydrochloric acid)	Available (Soluble in 1 p.c. citric acid).
July 15th, 1897, original, fresh	70·43	24·51	5·06	·575	·049	·32	·21	1·15	1·07
November 15, 1897, with Gypsum..........	71·77	17·97	10·26	·783	·057	·53	·46	1·37	1·29
November 15th, 1897, without Gypsum....	70·04	19·79	9·17	·911	·067	·64	·47	1·64	1·64

As we noted in the previous investigation the rotted manures are richer in all the essentials of plant food than the fresh manure, weight for weight.

Calculating these data to a water-free basis, we obtain the figures given in Table VII. These permit a closer comparison of the composition of the manures and show the same general result as regards the increase in the percentage of the elements of fertility, as were noticed in the previous experiment.

By multiplying the percentages in Table VI. by the weight of the manures, the data of Table VIII. are obtained. From these we may deduce the losses due to fermentation, and also learn what action the ground gypsum may have had in retaining or fixing the nitrogen which may escape as ammonia, or more strictly speaking, carbonate of ammonia.

In considering the organic matter, it would appear that the presence of gypsum had had a beneficial effect. From this experiment, it seems that gypsum retards to a certain extent the destruction of this constituent.

With respect to nitrogen, however, no useful result is to be observed under the conditions of this experiment from the use of gypsum. The amounts in the manure rotted with and without plaster are practically the same.

Ground gypsum, undoubtedly, may be used to advantage in the stable. The nitrogenous compound in the urine (*urea*), by the aid of certain micro-organisms, always present in the air, is converted very quickly into carbonate of ammonia. This is volatile and will escape if some suitable absorbent or fixer is not present. Gypsum is such a fixer, converting the carbonate into sulphate of ammonia, which is not volatile.

From the results of the investigations under discussion, it might be inferred that the greater part, at all events, of the nitrogen that escapes from fermenting manure is in the free state, that is, as gaseous nitrogen. If the manures had not been kept constantly moist, the results might have been different.

The practical conclusions from this part of this investigation are (1) that the proper place to use gypsum is in the stable, where undoubtedly the greater waste of nitrogen, as ammonia, frequently occurs, and (2) that when the manure heap is kept *compact and moist* there is not any considerable escape of ammonia.

Fermentation, it will be seen (table VIII.) as in the former experiment, has increased the availability of the phosphoric acid.

It is to be noticed that a considerable loss of potash has taken place in both manures. This must be due to a certain amount of drainage from the manures soaking into the board floor upon which they rested. This drainage was no doubt increased by the water used in keeping the manures constantly moist. This result corroborates the conclusions reached from a consideration of the foregoing investigation with exposed manure, namely, that loss of potash cannot be entirely guarded against without a water-tight, concrete floor, if the manure is to be kept moist by rain or artificial means.

TABLE VII.

COMPOSITION OF DRY MATTER, *i.e.*, WATER-FREE MANURE.

Manure. — (Horse and cow manure in equal parts.)	Organic Matter.	Mineral Matter or Ash.	Nitrogen.		Phosphoric Acid.		Potash.	
			Total.	As Ammonia Nitrates and Nitrites.	Total (soluble in hydrochloric acid).	Available (soluble in 1 p. c. citric acid).	Total (soluble in hydrochloric acid).	Available (soluble in 1 p. c. citric acid).
July 13th, 1897—Original, fresh ..	82·88	17·12	1·95	·165	1·08	·71	3·87	3·60
Nov. 15th, 1897—With gypsum ..	63·63	*36·37	2·73	·202	1·89	1·63	4·84	4·58
" 15th, 1897—Without gypsum	69·37	30·63	3·04	·22	2·14	1·57	5·43	5·43

* Containing added gypsum.

TABLE VIII.

AMOUNTS OF FERTILIZING CONSTITUENTS IN MANURES ROTTED WITH AND WITHOUT GYPSUM.

Manure. — (Horse and cow manure in equal parts.)	Organic Matter.	Mineral Matter or Ash.	Nitrogen.		Phosphoric Acid.		Potash.	
			Total.	As Ammonia Nitrates and Nitrites.	Total (soluble in hydrochloric acid).	Available (soluble in 1 p.c. citric acid).	Total (soluble in hydrochloric acid).	Available (soluble in 1 p.c. citric acid).
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
July 13th, 1897—Original, fresh, 6,000 lbs.	1470·6	303·6	34·5	2·9	19·2	12·6	69·0	63·9
Nov. 15th, 1897—With gypsum, *4,050 lbs.	727·8	*415·5	31·6	2·3	21·6	18·6	55·5	52·2
Nov. 15th, 1897—Without gypsum, 3,445 lbs.	680·7	315·9	31·4	2·3	22·0	17·0	56·9	56·9

* Containing added gypsum.

SOIL INOCULATION FOR THE GROWTH OF THE LEGUMES.

THE USE OF NITRAGIN IN AGRICULTURE.†

Nitragin is a bacteriological preparation containing the germs that reside in the nodules on the roots of leguminous plants, and which enable the host plant to utilize and appropriate free atmospheric nitrogen. Its use, by inoculation of the soil or seed, has been recommended to induce a more vigorous growth of the legumes, and in order to test its practital value for this purpose, experiments at the Central Farm were begun during the season of 1897. The results of these investigations and the deductions therefrom were set forth in the report for last year. A distinct increase in the amount of nitrogen, presumably from the application of nitragin, was observed in the crop in several of the inoculated series of plants.

To obtain further evidence on this subject, experiments of a similar character have been conducted during the past season, the treatment and method of culture being practically the same as in 1897.

PEASE.

The seed was sown on 2nd June; plants thinned to 11 in each pot; experiment closed and samples taken on 4th August, when most of the pods were fully formed. The vines were, however, still quite green and possessed some flowers. Culture used, *Pisum sativum.*

			Grams.
Pots 13 and 14, untreated, 11 plants, stems, leaves and roots		..	90·7
" 15 and 16, soil inoculated,	"	" ..	107·9
" 17 and 18, seed inoculated,	"	" ..	132·0

†A detailed account of Nitragin, its nature and uses, and of the principles of inoculation for free nitrogen appropriation in the growing of clover, pease, beans, etc., is to be found in the report of this Division for 1897, p. 141, et seq.

All the roots of the untreated pots possessed some nodules, showing that the soil used contained naturally the germs. It would appear that the micro-organisms, which thus assist the growth of the legumes, are widely prevalent in the soil of this district, since but little difficulty is experienced in obtaining a good crop of clover, pease, etc.

The nodules on the roots of the "soil inoculated" plants were apparently in about the same number as on the untreated plants. The effect of the nitragin, therefore, as judged by abundance of nodules, was not noticeable.

On the roots of the "seed inoculated" plants the nodules were more numerous and larger than on either of the preceeding.

The analytical data are presented in the following table :—

TABLE I.

PEAS : WEIGHTS OF CROPS, AMOUNTS OF NITROGEN, ASH CONSTITUENTS AND ORGANIC MATTER.

Sown, June 2nd, 1898. — Cut, Aug. 4th, 1898.	Pots 13 & 14. — Not inoculated.			Pots 15 & 16. — Soil inoculated.			Pots 17 & 18. — Seed inoculated.		
	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Weight, when cut	65·2	25·5	90·7	75·5	32·4	107·9	85·5	46·5	132·0
" nitrogen	·450	·148	·598	·535	·172	·707	·546	·193	·739
" ash or mineral constituents..	2·58	3·96	6·54	2·87	2·42	5·29	2·52	6·42	8·94
" organic matter.	14·29	3·55	17·84	16·11	3·56	19·67	17·86	5·22	23·08
" "dry matter"..	16·87	7·51	24·38	18·98	5·98	24·96	20·38	11·64	32·02

Taking an increase in weight of crop as evidence of the activity of nitragin, we may conclude that both in the soil and seed inoculated series this fertilizing agent has been effective. In the first place, it is to be noticed that the weights of the roots, as well as of the stems and leaves, are greater from the treated than from the untreated plants. Secondly, that the amounts of nitrogen, both in foliage and roots, of the inoculated plants exceed those in the plants from the untreated pots. Thirdly, that the amounts of "dry matter", that is, the organic and mineral substances of the plant, are also greater in the crops of the treated than in the untreated pots, showing greater assimilation on the part of the treated plants.

The nitrogen in the roots in all the trials was approximately one-third that in the stems and leaves, or one-fourth of the whole nitrogen present.

Comparing the value of soil inoculation with that of seed inoculation, this experiment shows that the latter was more effective.

In tables II. and III. we record the percentage composition of the fresh material and of the "dry matter." They allow a closer comparison of the composition of the pea plants, treated and untreated, and furnish corroborative evidence in favour of one or two conclusions drawn from last year's experiments.

The data of Table II. show that as regards the percentage composition of the foilage (stems and leaves) there is practically no difference between the treated and untreated plants. The larger amounts of nitrogen contained in the former are therefore due to the larger weight of foliage, produced presumably through the agency of the *nitragin*.

TABLE II.

PEAS: PERCENTAGE COMPOSITION OF FRESH MATERIAL.

Constituents.	Pots 13 & 14. — Not inoculated.		Pots 15 & 16. — Soil inoculated.		Pots 17 & 18. — Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen	·69	·58	·709	·53	·639	·416
Ash or mineral matter	3·95	15·53	3·81	7·47	2·95	13·81
Organic matter	21·92	13·93	21·32	10·98	20·88	11·22
Dry matter	25·87	29·46	25·13	18·45	23·83	25·03

TABLE III.

PEAS: PERCENTAGE COMPOSITION OF DRY MATTER.

Constituents.	Pots 13 & 14. — Not inoculated.		Pots 15 & 16. — Soil inoculated.		Pots 17 & 18. — Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen	2·70	1.97	2·82	2·87	2·68	1·66
Ash or mineral matter	15·28	52·71	15·15	40·46	12·38	55·19
Organic matter	84·72	47·29	84·85	59·54	87·62	44·81

Though there are some differences in the composition of the dry matter of the treated and untreated plants, these are slight and may be partly accounted for by the unavoidable errors of analysis. It is to be noticed that the composition of the pea plant throughout the series is quite similar. It is not apparent, therefore, from this investigation as some suppose, that the plants inoculated with nitragin are relatively richer in nitrogen than those not so treated In this connection, however, we should state that the check or untreated plants were not grown in sterilized soil, so that the present results do not altogether refute that conjecture. In last year's report we said that "the larger amount of nitrogen in the treated crop is rather due to a greater development of root or foliage or both, under the stimulating effect of the micro-organisms furnished by the preparation." This deduction receives confirmation from this year's work.

HORSE BEANS.

The seed was sown on 3rd June, plants thinned to 11 in each pot ; experiment closed and samples taken August 30th. Culture used ; *Vicia faba.*

Grams.

Pots 7 and 8, untreated, 11 plants, stems, leaves and roots......302·5
Nodules large, but not numerous.

Pots 9 and 10, soil inoculated, 11 plants, stems, leaves and roots...324·0
Nodules large and very numerous.

Pots 11 and 12, seed inoculated, 11 plants, stems, leaves and roots..261·5
Nodules, about the same as in 7 and 8.

The data obtained from this series are as follows :—

TABLE IV.

HORSE BEANS: WEIGHTS OF CROP, AMOUNTS OF NITROGEN, ASH CONSTITUENTS AND ORGANIC MATTER.

Sown, June 3rd 1898. — Cut, August 30th 1898.	Pots 7 & 8. — Not inoculated.			Pots 9 & 10. — Soil inoculated.			Pots 11 & 12. — Seed inoculated.		
	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.	Stems and Leaves.	Roots.	Total.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Weight, when cut	259·0	43·5	302·5	274·0	50·0	324·0	222·0	39·5	261·5
" of nitrogen	1·10	·51	1·61	1·10	·5	1·60	·94	·30	1·24
" ash and mineral constitutents.	4·89	15·1	19·99	4·73	12·2	16·93	4·89	6·33	11·32
" organic matter .	31·71	13·48	45·19	32·91	11·7	44·61	28·70	7·87	36·57
" "dry matter" .	36·60	28·58	65·18	37·64	23·9	61·54	33·59	14·20	47·79

The largest yield of crop was obtained from the "soil inoculated" plants; the smallest, from the "seed inoculated."

With regard to nitrogen, the amounts in the untreated and "soil inoculated" plants are practically identical; that in the "seed inoculated" plants is somewhat less.

The results in this series with horse-beans are certainly not such that definite conclusions may be safely drawn therefrom. With the "soil inoculated" plants there was, apparently, a benefit from the nitragin, but on the other hand, better returns were obtained from the untreated than from "seed inoculated" plants. The cause for this unsatisfactoriness is difficult to find, more particularly as the experiment was carried out in a similar way to that of 1897, when nitragin gave marked results with horse-beans. It is quite possible that the "culture" used had become impaired through the action of time, light or warmth. The manufacturers of nitragin, Messrs. Meister, Lucius & Bruning, Höchst am Main, Germany, now add a special caution on these points and say that it should be used within four weeks of the date of purchase at the latest.

In tables V. and VI. the percentage composition of the fresh material and dry matter is given.

TABLE V.

HORSE BEANS: PERCENTAGE COMPOSITION OF FRESH MATERIAL.

Constituents.	Pots 7 and 8. — Not inoculated.		Pots 9 and 10. — Soil inoculated.		Pots 11 and 12. — Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen	·425	1·17	·402	1·10	·425	·764
Ash or mineral matter....	1·89	34·70	1·72	24·4	2·20	16·03
Organic matter........................	12·23	31·00	12·03	23·4	12·93	19·92
Dry matter	14·12	65·70	13·75	47·8	15·13	35·95

TABLE VI.

HORSE-BEANS: PERCENTAGE COMPOSITION OF "DRY MATTER."

Constituents.	From Pots 7 and 8. — Not inoculated.		From Pots 9 and 10. — Soil inoculated.		From Pots 11 and 12. — Seed inoculated.	
	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.	Stems and Leaves.	Roots.
Nitrogen	3·0	1·80	2·92	2·09	2·81	2·12
Ash or mineral matter	13·35	52·83	12·58	51·14	14·55	44·60
Organic	86·65	47·17	87·42	48·86	85·45	55·40

The results in table V. show that differences of note exist in the composition of the roots, mainly due to varying percentages of water. While it might be interesting from a scientific standpoint to discuss the cause for this, we are at present unable to draw any conclusions of practical value, and can only hope that future investigations may give clearer evidence as to the value of this preparation.

PLOT EXPERIMENTS WITH NITRAGIN: CLOVER, PEAS, BEANS.

The experiments, the results of which have already been recorded were made in pots of special construction, as explained in our report for 1897. In order to test the effect of nitragin in the field, an area of 10 square yards was staked off and fertilized by the following mixture :—Superphosphate, 12 ozs. Muriate of potash, 4 ozs. These chemicals were well mixed with sand previous to application in order to facilitate uniform distribution. The soil selected was almost pure sand, humus and nitrogen being present only in exceedingly small quantities. The area was sown 13th June, as follows :—

Clover .... 2 rows, seed untreated, 2 rows, seed inoculated.
Horse-beans ...... 2 rows, seed untreated, 2 rows, seed inoculated.
Pease............ 2 rows, seed untreated, 2 rows, seed inoculated.

Clover.—On 28th October, the experiment was closed. The plants from four feet in each row were carefully dug and weighed. Culture used, *Trifolium pratense.*

Clover.	From untreated rows.	From inoculated rows.
Weight of foliage, green	8 oz.	9½ oz.
" roots, green	8 "	9 "
Total	16 oz.	18½ oz.
Weight of foliage, air-dried	3 oz.	3¾ oz.
" roots, air-dried	2½ "	3¼ "
Total	5½ oz.	7 oz.

The crop from the inoculated seed was much more luxuriant than that from the untreated seed, and the above results show that the yield was considerably heavier. In this case it would appear that the nitragin had exerted a beneficial influence of a most marked character.

Horse-beans.—The beans were allowed to grow until 10th October, when the crop was dug. The best twenty-four plants from the untreated rows were selected and a similar number of the best plants from the inoculatad seed were taken. The data as to weights were obtained from these selected plants. The roots were weighed with the stems and leaves.

Horse Beans.	From untreated seed.		From inoculated seed.	
	Lbs.	oz.	Lbs.	oz.
Weight of 24 best plants, green	1	11	1	10½
" " air-dried	.	7		7

It is not apparent from these results that the nitragin was of of any value in encouraging the growth of the horse-beans. In the pot experiments with horse-beans, already recorded, it will be remembered that this year no result from the nitragin was observed, which lends further weight to the doubt regarding the vitality of the preparation used.

Pease.—The plants, roots and foliage, were gathered on 9th August, six feet from the untreated and inoculated seed rows being taken for the yield.

Pease.	From untreated rows.		From inoculated rows.	
	Lbs.	oz.	Lbs.	oz.
Weight of plants, green	1	15	2	½
" air-dried		8½		9¼

Here again, though the difference is not a large one, the crop from the inoculated seed is the larger.

Our pot and plot experiments with nitragin for 1898 may, therefore, be said on the whole to confirm the results recorded in last year's report, and furnish further evidence towards establishing the usefulness of this agent in fostering the growth of the legumes.

FORAGE PLANTS, FODDERS AND FEEDING STUFFS.

THE GRASSES OF THE UPLANDS AND LOWLANDS OF MANITOBA AND THE NORTH-WEST TERRITORIES.

Information on the relative feeding value of grasses is useful to all engaged in stock raising and stock feeding, but especially so, we may say, to farmers and ranchmen of Manitoba and the North-west Territories, where frequently the native grasses must be relied on to supply the chief cattle fodder.

In order to gain further knowledge on this subject, as well as to be in a position to answer the many questions sent us repecting the relative merits of the *native grasses* and hays as grown on the *uplands* and *sloughs*, respectively, in the Canadian North-west, we have during the past season submitted a number of such grasses to analysis. Nos. 1 to 5, inclusive, were collected and forwarded by Mr. S. A. Bedford, Superintendent of the Experimental Farm, Brandon, Manitoba; Nos. 6 to 11, inclusive, by Mr. Angus Mackay, Superintendent of the Experimental Farm, Indian Head N.W.T.; No. 12 was received

from Col. Herchmer, Comptroller N.W.M.P., Regina, N.W.T.; No. 13 was sent by Mr. J. A. Smith, Saskatoon, N.W.T. The following notes regarding the botanical character of the samples were kindly furnished by Dr. Fletcher, Botanist of the Farms, who carefully examined these grasses on their arrival. For the other particulars I am indebted to Mr. Bedford and Mr. Mackay.

No. 1.—Grown at St. Norbert, 12 miles S.E. of Winnipeg, Man., on a stony, clay loam. *Lowland* (open prairie) partly flooded in June. Probable yield 2 to 2½ tons per acre. 1898 crop. The sample consisted almost entirely of the barren stems of the following sedges, Carex aristata and Carex stricta, the fine stems of the latter preponderating*.

No. 2. Grown at St. Vidal, 5 miles S. of Winnipeg, Man., on clay loam. *Lowland* (open prairie); wet in June. Probable yield, 2 tons per acre. 1897 crop. The sample consisted chiefly of barren stems of carices and grasses in equal proportion. Probably Carex stricta and Deyeuxia neglecta (Neglected Blue-joint), with a few fragments of Potentilla.

No. 3. From Red River Valley, 10 miles N. of Winnipeg on clay loam. *Lowland*, rather wet in June. Cut, 1st July. Probable yield about 2½ tons per acre. It consisted of fine, barren stems of Carex, probably straminea.

No. 4. Grown in Manitoba, on *Lowland*. The sample consisted entirely of a a sedge probably Carex aristata.

No. 5. From West Selkirk, 23 miles N. of Winnipeg; grown on black, medium loam, *Upland*, and well drained; yield, 1 to 1½ tons per acre; 1898 crop. This sample consisted chiefly of the following grasses in approximately equal proportions: Poa serotina (Fowl Meadow grass), Poa pratensis (June grass), and Phleum pratense (Timothy). Probably one-fourth of sample was made up of weeds, including Stinkweed, Canada Thistle, Heliopsis, Dandelion and leaves of Milfoil.

No. 6. North-west Territories. *Lowland* grass. It consisted chiefly of Deyeuxia confinis (Rough Pony grass), but contained some Hordeum jubatum (Squirrel-tail or wild barley grass), and Glyceria aquatica (Reed Meadow grass).

No. 7. North-west Territories. *Lowland* grass. Consisted entirely of Fluminia arundinaceae (white top) and had been cut when the seeds were about half ripe.

No. 8. North-west Territories. *Lowland* grass. Chiefly Deyeuxia confinis, with a few stems of Hordeum jubatum and Beckmannia.

No. 9. North-west Territories. *Upland* grass. Chiefly Festuca scabrella (Harsh fescue), Agropyrum glaucum (Colorado Blue stem) and Agropyrum caninum (Bearded Wheat grass; also a few stems of Stipa spartea (Spear grass), and Koeleria cristata (Western June grass).

No. 10. North-west Territories. *Upland* grass. Chiefly barren stems of the following grasses: Agropyrum glaucum, A. caninum, Festuca scabrella. There were also in the sample Stipa spartea, Avena pratensis and leaves of wild rose and Artemisia.

No. 11. North-west Territories. *Upland* grass. Very similar to Nos. 9 and 10, consisting of Agropyrum glaucum and A. caninum, mixed with a little wild rose and Western snowberry.

No. 12. From Regina, N.W.T.; sample of hay as fed to horses of North-west Mounted Police. It consisted entirely of the sedge, Carex aristata.

No. 13. From Saskatoon, N.W.T., consisted entirely of Sporobolus cuspidatus, generally considered a grass of but little agricultural value.

The foregoing data may be summarized as follows:—

Lowland hay from Manitoba, Nos. 1, 2, 3, and 4.
" " North-west Territories, Nos. 6, 7, 8 and 12.
Upland hay from Manitoba, No. 5.
" " North-west Territories, Nos. 9, 10 and 11.

---

* The carices are perennial grass-like plants of the sedge family and are characterized by solid, generally triangular, stems and rough-margined leaves.

COMPOSITION OF NATIVE GRASSES FROM "UPLANDS" AND "LOWLANDS," COLLECTED IN MANITOBA AND NORTH-WEST TERRITORIES.

Number of Sample.	Name.	Locality.	Hay (Air-dried Condition).						Calculated to Water-free Substance.				
			Water.	Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Ash.	Albuminoids.	Fat.	Carbo-hydrates.	Fibre.	Ash.
1	Sedges: Carex aristata, Carex stricta..........	St. Norbert, Man., "lowland"	7·28	7·12	2·37	42·39	34·39	6·45	7·69	2·55	45·71	37·09	6·96
2	Sedges and grasses in equal proportions: Deyeuxia neg. and Carex stricta.	St. Vidal, Man. "	6·28	10·00	3·52	45·49	28·30	6·41	10·62	3·76	48·59	30·19	6·84
3	Sedges: Carex straminea (?)....................	Red River Valley, north of Winnipeg, Man., "lowland".	6·38	7·06	2·51	49·41	29·52	5·12	7·50	2·68	52·82	31·53	5·47
4	Sedges: Carex aristata (?)....................	Manitoba "	7·43	10·00	3·15	44·60	28·43	6·39	10·81	3·40	48·17	30·71	6·91
5	Grasses and weeds: Poa pratensis, Poa serotina, phleum pratense.	West Selkirk, Man., "upland"......	6·20	8·62	2·46	46·89	28·21	7·62	9·19	2·62	50·00	30·07	8·12
6	Grass: Deyeuxia confinis, Hordeum jubatum, &c.	Near Indian Head, N.W.T., "lowland"	7·41	7·06	2·76	40·75	34·66	7·36	7·62	2·98	44·02	37·43	7·95
7	Grass: Fluminia arundinaceæ (White top)......	" " " ..	7·20	6·75	2·24	43·61	34·18	6·02	7·25	2·41	47·03	36·83	6·48
8	Grass: Deyeuxia confinis......................	" " " ..	6·65	7·00	2·75	41·52	35·88	6·20	7·50	2·94	44·49	38·43	6·61
9	Grasses: Fest. scabrella, Agro. glauc., Agro. can, &c	" " "upland".	7·04	8·25	4·06	41·99	30·96	7·70	8·87	4·36	45·19	33·30	8·28
10	Grasses: Agro. glaucum, Agro. caninum, &c., and weeds.	" " " ..	6·55	8·25	4·17	41·77	31·39	7·87	8·81	4·46	44·72	33·59	8·42
11	Grasses: Agro. glauc., Agro. can. and weeds....	" " " ..	6·94	8·31	3·70	40·66	32·47	7·92	8·93	3·97	43·70	34·89	8·51
12	Sedge: Carex aristata........................	Regina, N.W.T., "lowland"........	6·95	9·00	3·10	47·27	26·03	7·65	9·69	3·33	50·79	27·97	8·22
13	Grass: Sporobolus cuspidatus..................	Saskatoon, N.W.T.......	6·33	5·94	2·82	49·39	28·62	6·90	6·31	3·02	49·76	30·55	7·36

In order to understand the significance of the data contained in the foregoing table, it is necessary to know somewhat of the nature and functions of the nutritive constituents of fodders. We accordingly furnish this information briefly in the following paragraphs, referring our readers to previous reports for a more detailed account of the facts in this connection :

Albuminoids.—A collective name applied to the nitrogenous organic substances. They are the most valuable of all fodder constituents, and are essential to the formation of muscle, cartilage and the tissues generally, and of the animal fluids, blood and milk. Hence, they are known as "flesh formers." Though their principal office is repairing waste and making new tissue, they also serve to develop heat and energy when fat and the carbo-hydrates are lacking or in insufficient quantities. They may also serve for fat production. Whether animals are laying on flesh, producing wool or milk, or working, a supply of albuminoids is necessary, and experience has shown that economic feeding consists largely in obtaining these constituents at a minimum cost and feeding them in correct quantities.

Fat.—This ingredient has a high nutritive value, and in this respect ranks next to the albuminoids. By its combustion it generates the greater part of the heat of the body. Further, it is readily transformed into fatty tissue in the animal. It aids the digestion and assimilation of the albuminoids and preserves them in the animal economy from undue waste. It is the chief energy-producing constituent.

Carbo-hydrates. Consist of sugars, starch, gums and allied substances, and form a large percentage of the organic matter of plants. They are readily assimilated and oxidized in the animal system, producing much heat and energy. Under certain circumstances they may serve for fat production. They are not stored up by the animal. Carbo-hydrates are frequently classed as "Nitrogen-free extract."

Fibre.—Compared with the constituents already discussed, fibre has a low nutritive value. It forms the woody parts of the stems and leaves of plants and a large part of the hull or husk of seeds. As a rule, the fibre becomes harder and less digestible as the plant approaches maturity. In chemical composition and function as a food, fibre is similar to the so-called carbo-hydrates.

Ash or Mineral Matter.—This contributes to the formation of bone and supplies the tissues throughout the body with the minute quantity of mineral matter they require. It also replaces those saline substances daily excreted.

It will be observed that the Lowland hay is chiefly, sometimes wholly, composed of sedges, which are usually considered as decidedly inferior to the true grasses in feeding value. It is quite doubtful if the sedges are as palatable or digestible as the grasses, being, as a rule, somewhat harsh and tough ; yet we have the testimony of many ranchers and stockmen that both horses and cattle thrive well and fatten upon hay entirely made up of sedges. Colonel Herchmer, who sent sample No. 12, informs us that the horses of the North-west Mounted Police eat the sedge hay with avidity and keep in good condition.

The principal sedge in these lowland hays is *Carex aristata*. In albuminoids it compares most favourably with many grasses, and indeed all the data show it to have nutritive qualities of a high order. The various analyses of this sedge here tabulated lead us to infer the samples were not all obtained at the same stage of growth. We may presume that the richer samples are from the earlier cut hay, since in all probability, as with the grasses, the sedges deteriorate as they ripen.

This series contains too few samples of Upland native hay to allow any decisive conclusions being drawn as to their relative merits compared with hay from lowlands. Indeed, the differences, as revealed by the analytical data, are by no means marked. The following averages, prepared from the foregoing table, are, however, interesting :—

Hay.	Number of Samples.	Water.	Albuminoids.	Fat. (Ether extract.)	Carbo-hydrates.	Fibre.	Ash.
Lowland hay, principally sedges	8	6·96	8·03	2·91	44·09	31·37	6·64
Upland hay, grasses with weeds	4	6·56	8·39	3·44	43·10	30·71	7·80

The analysis of the hay of Sporobolus cuspidatus (No. 13) from Saskatoon, shows this to be rather a poor grass and decidedly inferior as regards albuminoids to the other hays of this series.

As pointed out in Bulletin No. 19, grasses, like all cereals, are particularly susceptible to environment, improving greatly under cultivation. The rich fertile soils of Manitoba and the North-west Territories should be conducive to the growth of grasses containing high percentages of albuminoids, and we may, therefore, expect that the native grasses of the prairies will under cultivation become still more nutritious than the present results indicate. This deduction must not be understood as in any sense contradictory to the statement made from previous work (Bulletin 19) that these North-west hays are highly nutritious and furnish a coarse fodder of valuable feeding qualities. Regarding the sedges, we must admit to some surprise in finding them compare so well with the grasses; nevertheless it is only to be expected that as the growing of grasses receives more attention in the North-west their use will become confined to certain more or less restricted areas.

TIMOTHY AND BROME GRASS HAYS.

Attention was directed to the composition and feeding value of Brome grass in the report of the Division of Chemistry for 1897. The analyses of Brome hay, the results of which are there stated, were made on samples grown on the Experimental Farm, Indian Head, N.W.T. The data showed that this hay possessed nutritious qualities of a high degree.

During the past year we have made a comparative study of the hays of Timothy and Brome grass as grown on the Central Farm, Ottawa, during the season of 1897. Both grasses were cut when considered in the best condition, the samples were taken in February from the barn. The analytical data are presented in the following table:—

COMPOSITION OF THE HAYS OF TIMOTHY AND BROME GRASS, GROWN ON CENTRAL EXPERIMENTAL FARM, OTTAWA, 1897.

Hay.	Moisture.	Albuminoids.	Fat (Ether extract).	Carbohydrates.	Fibre.	Ash.
Timothy hay	9·72	5·94	5·38	43·25	31·30	4·41
Brome grass hay	10·76	6·61	4·51	41·01	31·86	5·25

The nitrogenous compounds, grouped under the term albuminoids, are the most important from a feeding standpoint, and in this regard the Brome grass is seen to be somewhat the better of the two. Stated in pounds per ton, we have the following figures:—

	Albuminoids pounds per ton.
Timothy	118·8
Brome grass hay	132·2

By calculating our data to a water-free basis, we may make a closer comparison of the composition of the real cattle food in the two hays.

COMPOSITION OF THE "DRY MATTER": TIMOTHY AND BROME GRASS HAYS.

Hay.	Albuminoids.	Fat (Ether extract.)	Carbohydrates.	Fibre.	Ash.
Timothy hay...	6·58	5·96	47·90	34·67	4·89
Brome grass hay..............................	7·40	5·05	45·95	35·69	5·91

SOJA BEANS *(Soja hispida.)*

During the season of 1897, this annual legume was first tried as a field crop on the Central Farm. The results obtained gave promise of it becoming a valuable fodder for siloing in conjunction with corn. The indications were that it could be grown with greater certainty of success than horse beans—being better able to withstand drought and hot weather. Soja beans share with other legumes the property of being rich in nitrogenous matter.

Further experiments in growing this crop have been made during the past summer, the details and results of which will be found in the report of the Director and Acting Agriculturist for the current year. In connection with those results, we here present analytical data obtained from plants which had been grown with varying distances between the rows and from crops sown at different dates; the object of the investigation being to ascertain what effect, if any, these conditions and factors had upon the nutritive value of the crop.

In the first series, six average-sized plants, from the crop sown 26th April, were taken, severally, from rows (a) 3 feet apart, (b) 2 feet 6 inches apart, and (c) 2 feet apart.

In the second series, a similar selection was made from the crop sown 17th May, the drills or rows being (a) 21 inches apart, (b) 14 inches apart, and (c) 7 inches apart.

All the samples were taken on 12th September, the plants being quite green, well podded and in good condition generally.

The analytical data showing the composition of these plants have been arranged in the following tabular form:—

SOJA BEANS—PERCENTAGE COMPOSITION OF FRESH MATERIAL.

Soja Beans.	Water.	Albuminoids. (Crude Protein.)	Fat. (Ether Extract.)	Carbo-hydrates. (Nitrogen,—free Extract.)	Fibre.	Ash.
Soja Beans, sown 26th April, cut 13th Sept.,						
" " " drills 3 ft. apart.	71·25	2·58	1·53	13·68	8·85	2·11
" " " 2 ft. 6 in. apart	71·89	2·80	1·71	12·52	8·99	2·09
" " " 2 ft. apart.....	73·16	2·65	1·15	12·00	9·08	1·96
Average........................	72·10	2·68	1·46	12·73	8·97	2·05
Soja Beans, sown 17th May, cut 13th Sept.,						
" " " drills 21 in. apart....	74·03	2·62	·89	11·57	8·85	2·04
" " " 14 in. apart....	71·48	2·22	1·01	14·42	8·79	2·08
" " " 7 in. apart	72·64	2·19	1·21	13·39	8·53	2·04
Average	72·72	2·34	1·04	13·13	8·72	2·05

It is not observable in the first series that the varying distances between the drills has had any *marked* effect upon the composition of the plants; the differences, as revealed by the foregoing results, being small and irregular, might legitimately be attributed to other causes In the second series, the later sown plants, those planted with the greatest distance between the rows, are somewhat the richer, since they contain a slightly higher percentage of nitrogenous compounds (albuminoids).

Comparing the composition of the plants from the early and late sowing, we again notice but very little difference. Such as there is, however, is in favour of the earlier sown beans.

To enable the reader to form some estimate of the food value of this new crop, as compared with other legumes, we append the following table, containing results obtained in the Farm laboratories during recent years together with other data gleaned from the publications of the United States Experiment Stations:

PERCENTAGE COMPOSITION OF LEGUMES.

Name.	Water.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.
Red Clover, in bloom	72·70	4·30	·90	13·40	6·50	2·20
Alfalfa	71·75	4·84	·97	12·39	7·39	2·66
Serradella, in bloom	79·85	2·87	·74	9·95	3·45	3·12
Bokhara Clover, in bloom	76·52	2·77	·44	12·06	6·59	1·62
Vetch, in bloom	83·90	4·04	·63	6·19	3·24	2·00
Cowpea	86·03	3·25	·62	5·34	2·87	1·89
Beans, Broad Windsor, in bloom	84·59	3·33	·63	5·67	4·14	1·64
" English Horse "	89·24	2·75	·73	2·26	3·71	1·09
" Telephone "	83·81	2·99	1·00	6·79	3·70	1·71
" Soja "	72·10	2·68	1·46	12·73	8·97	2·05

BY-PRODUCTS OF THE OAT: OAT DUST: OAT FEED.

In the manufacture of oatmeal, now so largely and almost universally used at breakfast, several by-products are formed, which find a more or less ready sale as feed—more especially for cows—under the name of oat feed, oat shorts, oat dust, oat dust feed, etc. These may vary greatly in character and feeding value, according to the part of the oat grain predominating and the presence or absence of mill sweepings. The hulls and the hair of the kernel probably form the basis of most of the feeds known as oat dust, and must be considered of low, or, at best, but medium feeding value. There are feeds, however, sold sometimes under the name of oat shorts and oat feed that contain large quantities of broken grain, a very small proportion of hulls, and no sweepings. These have a clean, bright appearance, are heavy, close and fine and must be considered as valuable feed, especially at the price they can frequently be obtained from the oatmeal mills.

Many correspondents during the past year have made inquiries respecting the value of these by-products, and several samples of these new feeding stuffs have been received for analysis. The results obtained from their examination are tabulated as follows:—

COMPOSITION OF "OAT FEED", "OAT DUST", "OAT SHORTS", &c.

No.	Sent by.	Moisture.	Albuminoids.	Fat.	Carbohydrates.	Fibre.	Ash.
1	T. S. Eager, Heckston, Ont	5·20	17·93	6·54	56·00	9·92	4·41
2	Robt. Holmes, Langton, Ont	5·06	11·25	5·08	51·68	20·24	6·69
3	McKay Milling Co., Ottawa, Ont	5·25	11·02	5·09	51·16	21·43	6·05
4	Thos. Fuller, Trenton, Ont	5·71	12·81	5·83	57·82	13·40	4·43
5	C. E. F., Ottawa, Ont	6·69	12·81	3·97	45·78	18·98	11·77

No. 1. Was sent by T. S. Eager, Heckstone, Ont., and purported to be a sample of "oat shorts" from the Kemptville Milling Co., and was selling at about $10.00 per ton. It was the best of all the samples examined. In its percentages of albuminoids and fat, the two most important constituents, it stands highest, and in fibre, the least valuable element, it is the lowest. It must certainly be considered a feeding stuff of high value.

No. 2. Forwarded by Robert Holmes, Langton, Ont., was labelled "Oat Dust from the Tilson Mills, Tilsonburg, Ont." This and the following samples are inferior in feeding value to No. 1. They are somewhat similar as regards composition, though No. 4 should rank next in value to No. 1, owing to its low percentage of fibre.

No. 3. Obtained from the McKay Milling Co., Ottawa, Ont. A good average sample.

No. 4. Sent by Thomas Fuller, Trenton, Ont., and labelled "Oat Meal Dust" from Messrs. Sadler, Dundas & Flavelle Milling Co., Lindsay, Ont.

No. 5. Is a sample from the "cleaning up" of oats on the Central Experimental Farm, and is consequently somewhat inferior to the feeds just discussed.

A mechanical separation of these feeding stuffs was made with the results found in the following table:—

OAT FEED, OAT DUST—MECHANICAL SEPARATION.

Material.	FINE. — (Passed mesh $\frac{1}{38}$ inch.)	MEDIUM. — (Passed mesh $\frac{1}{18}$ inch.)	Hulls.
No. 1—Oat shorts	65·5	30·0	4·5
2—Oat dust	52·0	30·0	18·0
3— "	44·0	40·0	16·0
4—Oatmeal dust	43·0	28·0	29·0
5—Oat screenings	38·0	40·0	22·0

As before remarked, the larger the proportion of "fine" and "medium", the better quality, in all probability, will be the feed. A careful scrutiny will often enable the farmer to arrive at a fair estimate as to the worth of these materials.

Professor Henry, in his work entitled "Feeds and Feeding," gives the following data as representing the digestible nutrients in oats and their by-products:—

DIGESTIBLE NUTRIENTS OF OATS, OATMEAL, OAT DUST, ETC.

Name of Feed.	Dry Matter in 100 Pounds.	Digestible Nutrient in 100 Lbs.		
		Albuminoids.	Fat.	Carbohydrates.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Oats	89·0	9·2	4·2	47·3
Oat Meal	92·1	11·5	5·9	52·1
Oat Feed or Shorts	92·3	12·5	2·8	46·9
Oat dust	93·5	8·9	5·1	38·4
Oat hulls	90·6	1·3	·6	40·1

Until quite recently, oats, it may be said, were grown almost exclusively as feed for animals, and more especially for horses. Since preparations of oats are now so

popular for human consumption, the probabilities are that the supply of these by-products will increase. Dairymen and stockmen, therefore, will do well to know that these materials are exceedingly variable and that good judgment must be exercised in their purchase.

FEEDING VALUE OF MOLASSES REFUSE OR SYRUP.

In the refining of sugar, especially that made from the beetroot, a by-product of the nature of molasses is obtained from which it is impossible with profit to crystallize the remaining sugar, owing to the presence of albuminous materials and saline matter, which latter consists more especially of salts of potash. This molasses refuse has been manufactured on the European continent into a cattle food by being mixed with meals of various kinds, and sometimes with turf or moss litter, and subsequently dried and pressed. The product is a "cake", which has been used with great success for milch cows, fattening stock and horses. When the molasses is fed by itself, that is, unprepared, in large quantities it loosens the bowels; but fed judiciously say, in quantities of 2 or 3 pounds daily as a part of a well balanced ration—it has given excellent results and has proved itself a valuable and economical feeding stuff.

In the early part of the present year, inquiries were received from correspondents in Nova Scotia and Quebec as to the composition and value of this crude syrup, and samples were forwarded from General J. W. Laurie, Oakfield, N.S., and Mr. James W. Stairs, Halifax, N.S., for examination. These samples were duly analysed, with the following results:—

COMPOSITION OF MOLASSES REFUSE.

	No. 1.	No. 2.
Water	24·89	26·42
Cane sugar	50·27	50·05
Glucose	1·95	5·00
Nitrogenous organic matter	7·81	6·85
Nitrogen-free organic matter (undetermined)	5·98	3·10
Ash or mineral matter	9·10	8·58
	100·00	100 00

As regards the important feeding constituents, these samples are practically identical, so that individual consideration will not be necessary.

The large proportion of sugar—which we must regard as immediately digestible food—makes this material undoubtedly a very valuable feed stuff.

Though not wanting in nitrogenous matter, its use for due economy should be supplemented with a certain proportion of some concentrated meal or meals rich in flesh-forming constituents.

The large percentage of "ash" is to be noted, one-half of which is potash. It is the presence of this, no doubt, that is the cause of the looseness of the bowels in cattle fed above a certain quantity per diem. When symptoms of this condition are observed, the quantity of molasses fed should be reduced. Since the potash is not retained by the animal, but is eliminated by the kidneys, the urine will be especially rich in this element and, therefore, should be carefully preserved by the use of absorbent bedding.

General Laurie, who has fed the molasses to fattening steers (at the rate of from 3 to 5 pounds per diem), diluted somewhat and poured upon the cut roughage or coarse fodder, reports that the animals develop a great liking for it, and that to all appearances it is giving good results.

The most important points in favour of this new feeding stuff may be stated as follows:—(1) that it contains a large percentage of sugar, the most assimilable form of carbo-hydrates found in cattle feeds. This class of nutrients is used by the animal to

the production of energy the maintenance of the vital heat and the production of fat; (2) that it stimulates the appetite, and (3) probably increases the digestibility of the other constituents of the ration.

The cost of the crude syrup we understand, is three-quarters of a cent per pound at the refinery, and at this price it should prove a profitable feeding stuff. The amount that can be economically or safely fed per day is probably between 2 and 4 pounds.

COMPOSITION OF COCOA SHELLS.

This is a waste or by-product from the cocoa and chocolate factory. A sample received from Halifax, N.S., with a request for a report on its feeding value, furnished the following data :—

	Per cent.
Moisture	5·12
Albuminoids (flesh formers)	16·44
Fat	12·92
Carbohydrates—sugar, etc	45·43
Fibre	13·17
Ash or mineral matter	6·92

FERTILIZING CONSTITUENTS.

Nitrogen	2·63
Phosphoric acid	·98
Potash	2·59

The analysis makes clear that it contains a high percentage of albuminoids, and is also rich in fat—two of the most important constituents of a feeding stuff. Providing it is fairly digestible, a point upon which we have no information, save that cocoa butter or fat is readily assimilated,—this refuse material is a concentrated feed of high order. If ground to the condition of a fine meal, I am of the opinion that its digestibility would be much increased, and that it would prove serviceable as furnishing a part of the concentrated portion of the ration.

The quantity that could safely or profitably be fed per diem would have to be ascertained by actual experiment; probably about 2 pounds a day, with other meal, would be the limit. Again, it is not known whether it would impart any flavour to the milk or butter produced, but we should not expect to find any, if used in the amount already indicated.

Attention is directed to the richness of this material in fertilizing constituents, more especially nitrogen and potash. These, for the most part, would be recovered in the solid and liquid excreta of the animals to which it was fed.

SUGAR BEETS.

At the request of the Department of Agriculture of British Columbia, a chemical analysis has been made of certain samples of sugar beets grown in that province. The beets, comprising 17 samples, were received during December, 1897 and January, 1898. Nearly all the roots had sprouted, and consequently had deteriorated as regards sugar content.

Many of the roots were too large for the sugar factory; from 1 pound to 2 pounds is the weight sought by experienced growers. Beets heavier than this are invariably low in sugar. Again, many of the beets were forked and irregular in shape, showing a poor tilth and probably a hardy and stony condition of the soil. Such roots are not liked at the factory, as they entail a considerable waste of material.

The following data are furnished by Mr. J. R. Anderson, Deputy Minister of Agriculture, Victoria, regarding the beets. The seed had been supplied to the grower by the Department of Agriculture for British Columbia :—

PARTICULARS *re* SUGAR BEET SAMPLES SENT FOR ANALYSIS.

Number.	Name of Grower.	Locality where grown.	Nature of Soil.	Culture.
1	W. le Poer Trench	North Saanich		
2	S. Knight	Popcum		
3	R. McBride	Sea Island		
4	D. Rowan	Lulu Island	Clay loam	Planted May 18, lifted Nov. 13; 18 ins. between rows, 10 ins. between plants.
5	H. T. Thrift	Hall's Prairie	Black bottom soil; heavy clay subsoil.	Planted May 12, lifted Nov. 9; 18 ins. between rows, 10 ins. between plants.
6	J. A. Catherwood	Mission	Dark sandy loam soil (a year previous was "alder bottom").	Planted May 24, lifted Nov. 13.
7	W. J. Harris	Pitt Meadows	Clay loam	Planted May 24, lifted Oct. 20; 2 ft. between rows.
8	G. H. Hadwen	Quamichan		
9	R. H. Breeds	North Saanich		
10	T. W. Graham	Shuswap	Loam with clay bottom	Planted May 16, lifted Oct. 3; drilled 26 ins. apart.
11	G. Hutcherson	Delta		Rows 12 ins. apart.
12	J. T. McIlmoyl	North Saanich		
13	H. V. Baker	Cranbrook	Heavy loam	Planted middle June, lifted end of Aug.; 18 ins. between rows and plants.
14	A. C. Wells & Son	Chilliwack	Clay loam	Planted May 14, lifted Nov. 4; 2 ft. between rows, 9 ins. between plants.
15	H. F. Page	Matsqui	Sandy loam	Planted July 1, lifted Nov. 10; 18 ins. between rows, 9 ins. between plants.
16	Thos. Kidd	Lulu Island	Alluvial loam	Planted May 26, lifted 1st week in Nov.; 18 ins. between rows, 8 ins. between plants.
17	J. M. Manley	Agassiz	Sandy; some little clay mould.	Planted May 25, lifted Nov. 1; 2 ft. between rows, 6 ins. between plants.

The value of beets for the manufacture of sugar depends upon their richness in sugar and the purity of their juice (coefficient of purity). To obtain beets with a high sugar content and pure juice, it is not only necessary to procure sow seed from tested roots or varieties of acknowledged richness, but also to pay great attention in the selection and preparation of the soil and the subsequent culture of the beets. For information on this subject the reader is referred to pages 132, 133 of the Report of the Farms for 1890.

The results of our examination have been prepared in tabular form, as follows:—

ANALYSES OF SUGAR BEETS FROM BRITISH COLUMBIA, 1897.

No.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root. Lbs.	Oz.	Remarks.
1	15·1	18·0	83·9	1	8	Medium size, regular, good shape.
2	11·4	15·4	74·0	2	3	All sprouted " "
3	11·8	16·3	72·4	3	0	Too large, all sprouted "
4	10·4	15·2	68·4	3	5	" " much forked.
5	14·8	18·3	80·9	2	9	" " some roots forked.
6	15·3	18·2	88·2	0	9	All sprouted, of good shape and regular.
7	11·0	14·1	78·3	0	12	Very much sprouted.
8	11·9	16·2	73·8	1	15	Regular, not sprouted.
9	14·7	17·8	82·8	1	9	Several roots sprouted, fair shape and size.
10	12·5	16·5	76·0	3	1	All sprouted, good shape, but too large.
11	15·0	18·0	83·3	1	6	All somewhat sprouted, forked.
12	13·2	18·2	72·5	3	12	" " too large, several forked.
13	16·0	21·7	73·9	1	6	" " good size, but forked.
14	12·2	16·9	76·4	3	12	" " good shape, not forked, too large.
15	13·0	18·4	70·7	1	12	" " good size, but irregular.
16	13·5	18·5	73·0	1	1	Not sprouted, regular, good size and shape.
17	14·2	18·6	76·3	0	13	Good size and shape.

These figures do not indicate, in the majority of instances, either a rich or pure juice, but as many of the roots had not received any special culture and were badly sprouted, they must not be regarded as demonstrating the possibilities of British Columbia in producing beets profitable for sugar extraction. There is no reason to suppose there are any conditions of soil or climate in British Columbia inimical to the production of rich beets with a high percentage of sugar.

CANADIAN AND HUNGARIAN FLOURS.

At the request of the Hon. Minister of Agriculture, the following critical study of samples of Canadian and Hungarian flours was made. The flours selected were "Best Patent," Lake of the Woods Milling Co., and "5-Star best grade E.O.P.O. Hungarian."

ANALYSIS OF FLOURS.

——	Best Patents. Lake of the Woods Milling Co.	5-Star Best grade. E. O. P. O. Hungarian.
Moisture	11·47	11·51
Albuminoids	12·59	11·27
Fat or oil	1·82	1·87
Ash or mineral matter	·37	·34
Wet gluten	34·22	26·17
Dry gluten	12·33	9·79
Ratio of "dry" to "wet" gluten	2·77	2·67

Moisture.—The percentages obtained are so close that the flours, as regards this constituent, may be considered as practically identical.

Total Albuminoids or Protein :—The percentages of total albuminoids—the most important constituent of flour from a nutritive standpoint—have been obtained by the usual method, the multiplication of the percentages of nitrogen (directly estimated) by 6·25.

The present results show the Canadian flour to be much the richer of the two (approximately, 10 per cent calculated on the albuminoid content) in these nitrogenous substances, of which the special function in the animal economy is the formation and repair of the principal tissues of the body.

Fat and Ash.—As in the case of the moisture, the data representing these two constituents in the two samples differ so little that special comment as to the relative percentages is unnecessary.

Gluten—Wet and Dry.—Though not of the same accurate nature as the foregoing analytical data, the determinations recorded under these headings are exceeding useful as indicating the relative "strengths" of the flours. The term *strength*, as used by millers and bakers, denotes, chiefly, the bread yield, which is largely dependant upon the power of a flour to absorb and retain water ; it also includes, however, "capacity of a flour for producing a well-risen loaf", that is, it takes into consideration other physical properties besides that above mentioned—qualities usually concomitant with the absorbent ratio.

The weights of moist and dry gluten from the Lake of the Woods flour exceeded those from the Hungarian sample. If the amounts of moist and dry gluten in the former be each represented by 100, then 77 and 79 will represent the moist and dry gluten, respectively, in the latter. We may therefore, conclude as regards yield of bread from a given weight of flour, that the Canadian brand is far superior. The "falling off" in the oven would be somewhat similar for both flours.

Respecting the *quality* of the gluten, that prepared from the Lake of the Woods sample was found to be firm, tough and elastic ; indeed, as far as one could judge, these properties—so valuable in bread-making—were more marked in the gluten from the Canadian flour than that from the Hungarian flour.

The chemical data, strength and gluten estimations, in our opinion, all point to the superiority of the Canadian flour for bread-making purposes.

CANADIAN SOILS.

But very few soils have been submitted during the past year to complete analysis, owing to the large amount of other and more pressing work. There now awaits examination a considerable number of samples of virgin soils, which will be taken in hand and reported upon as opportunity permits. Certain samples have received a preliminary or partial analysis, and suggestions as to the treatment of these soils drawn from the results obtained, have been furnished to the interested parties. A few of the more important of these reports are here inserted, in the belief that they will furnish useful information to many of our readers.

From Grindstone Island, Magdalen Islands, Que. Two soils, the one a virgin soil ; the other, cultivated for some years, but never manured, were forwarded by Mr. A. S. D. Van Barnveldt, estate agent and representative, Grindstone Island, who is anxious to establish agriculture among the fishermen there. He requested that the analysis be accompanied by suggestions for economically increasing the fertility of the soil and the most profitable chemical fertilizers to apply. Both samples show the red colour so

characteristic of the soils of Prince Edward Island. They are light, sandy loams, full of small pieces of the sandstone which has formed the basis of the soils. The fine soil, separated by sifting, was submitted to analysis, with the following results:

A. Cultivated, but never manured; had grown oats and hay for several years.

B. Virgin soil—unmanured and uncultivated.

ANALYSIS OF SOILS FROM GRINDSTONE ISLAND, MAGDALEN ISLANDS, QUE.

Constituents.	"A" Cultivated soil	"B" Virgin soil.
Moisture	2·49	3·14
Loss on ignition (organic matter)	6·31	9·79
Insoluble residue (clay and sand)	81·13	77·04
Oxide of iron and alumina	8·85	8·90
Lime	·17	·25
Magnesia	·97	1·33
Potash	·14	·19
Phosphoric acid	·22	·24
Soluble silica	·05	·05
	100·33	100·93
Nitrogen	·162	·189

Though these soils, as regards chemical composition and texture, must be considered below the average, they are by no means wanting in the elements of fertility, and their improvement might be undertaken with a fair hope of success, providing the climatic conditions for crop production are not unfavourable.

First, we would advocate the addition of organic matter. This would be especially valuable in making the soil more firm and compact and more retentive of moisture, warmth and plant food. The further decay of such organic matter within the soil would assist in liberating mineral plant food in an available condition. Barn-yard manure, of course supplies organic matter in large quantities, but as I understand there is not an adequate supply of this material on the Island, the use of such naturally occurring fertilizers and by-products as sea-weed and fish offal, both of which contain other elements of fertility in large proportions—the former being rich in potash, the latter, in phosphoric acid—is to be strongly advised. Further, the growth of clover or some other of the legumes would be most beneficial. The turning under of such a crop would not only enrich the soil in humus and available potash and phosphoric acid, but would also increase its percentage of nitrogen. The extensive growth of clover is sure to be followed with good results. It may be sown with all grain crops, the clover being ploughed under as late in the season as the weather allows, or in the following spring. It would also, no doubt, be an economical method to sow clover expressly for the purpose of turning under. This so-called "green manuring" is perhaps the most profitable and permanent method for the enrichment of such soils that could be recommended. To induce a good growth of clover, the soil should receive an application of potash and lime. Wood ashes, kainit, or muriate of potash would supply the former; lime, marl, or gypsum, the latter. If wood-ashes are used, there would be no necessity to add lime or any of its compounds, since they contain about 30 per cent of lime.

These soils are especially poor in lime, and consequently a dressing of lime (20-40 bushels per acre), or gypsum (say, 200 to 500 pounds per acre) would be most advantageous. Nitrogen and phosphoric acid would be furnished by fish offal, of which I suppose there is a more or less ample supply on the islands.

Respecting commercial fertilizers, I would say that their use should only be supplemental to the treatment already outlined. These soils are leachy and must be made more retentive before the greatest good can be expected from the use of soluble plant food as is supplied by chemical fertilizers.

If organic matter and nitrogen can be furnished in the way indicated, and phosphoric acid and potash added by means of fish waste and sea-weed, the further improvement by potash salts, superphosphate, or Thomas slag (for phosphoric acid) and nitrate of soda, will be accompanied with profit. It is impossible to state exactly the amounts of these materials that will give the best results, but the following quantities will serve as a guide. The character of the crop to be grown will necessarily determine this to a large extent :—

Superphosphate	300 lbs. per acre.
or	
Thomas basic slag	300-500 lbs. "
Kainit	200-400 lbs. "

to be harrowed in after autum ploughing.

After growth has appeared in the spring, broadcast 50 pounds of nitrate of soda per acre, to be followed by another dressing of 50 pounds some three weeks or a month later.

In the treatment of light soils, such as we are now considering, it is always better to apply manures and fertilizers in moderate quantities annually, than large dressings at less frequent intervals.

In comparing the analytical data of the two soils, the exhaustive effect of the cropping without replacing the plant food is quite apparent. In all the principal constituents that go to make up soil fertility-humus, nitrogen, potash, lime, and phosphoric acid—the virgin soil (b) shows much larger amounts. These facts teach a lesson that should not be neglected, for under the present onesided method of farming it will not be long before the store of plant food in the soil is so reduced that crops cannot be profitably grown.

From Pefferlaw, Ont.—Forwarded by Thos. Corner : A grayish black, sandy loam of a very loose texture. From appearance, it would be judged as warm and responsive, but light and apt to dry out quickly.

ANALYSIS OF SOIL (AIR DRIED.)

	Per cent.
Moisture	1·99
Organic and volatile matter	9·62
Mineral matter, soluble in acid, chiefly oxide of iron	5·76
" insoluble in acid, chiefly sand	82·63
	100·00

Lime ...... Very small quantity.

	Per cent.
Nitrogen	..·264
Sand (approximately)	78·00
Clay, organic matter, &c. (approximately)	22·00

For a sandy soil it may be accounted rich in organic matter and nitrogen, though it is doubtful if any large percentage of the latter is in a condition immediately available as plant food.

In mineral constituents, save iron and alumina, it is poor, and therefore fertilizers supplying phosphoric acid, potash and lime, as well as available nitrogen, should be employed.

In recommending a fertilizer for onions, especially asked for by one correspondent, on this soil, we would point out that if any way possible, the land should have a coating of well-rotted barn-yard manure, poultry manure or rich compost. As it is stated that wood ashes are not obtainable, the following fertilizer would probably be most economical and profitable to use:—

Superphosphate	250 pounds per acre.
Muriate of potash	200 " "
Nitrate of soda	150 " "

Apply the superphosphate and muriate of potash in the autumn, if possible, lightly ploughing or harrowing under the mixture. Apply the nitrate of soda broadcast in, say, three top dressings, the first being given soon after the growth of the young plants has begun. The second and third applications may be made at intervals of three weeks.

From Township of Nepean, near Ottawa, Ont.—Forwarded by Mr. Hugh Hinds: A grayish red, sandy loam, and would be termed a very light soil.

ANALYSIS OF SOIL (air-dried).

	Per cent.
Moisture	1·31
Organic and volatile matter	5·63
Mineral matter, soluble in acid, chiefly oxide of iron	6·45
" insoluble in acid, chiefly sand	86·61
	100·00

Lime.................Only present in traces.

	Per cent.
Nitrogen	·154
Sand (approximately)	86·00
Clay, organic matter, &c. (approximately)	14·0

For a soil of this character, it would not be considered deficient in organic matter and nitrogen, though both of these must be greatly increased, either by stable manure or ploughing under green clover or peas, if the best results are to be expected. The soil would also respond to liberal applications of lime, phosphoric acid and potash. It also stands in need of lime.

To furnish the soil quickly with humus (vegetable matter) and nitrogen, no better material than stable manure—and the soil would easily stand 20-30 tons per acre—could be advised. If wood ashes can be readily obtained, they will probably be the cheapest form of potash available. They also furnish phosphoric acid and lime. For potatoes, vegetables and fruit trees, use from 50 to 100 bushels per acre, lightly ploughed or harrowed under as early in the season as possible.

During the early weeks of growth, give a top dressing (broadcast) of nitrate of soda, for vegetables, and if it can be afforded, for all crops, save the larger fruit trees. It is well to apply this fertilizer in two dressings, a few weeks apart, using about 50 to 60 pounds per acre at each application.

From near Port Arthur, Ont.—A yellowish-red sandy loam, and, from appearance, as well as from the analytical results, would be considered a light soil, somewhat below average fertility:—

ANALYSIS OF SOIL (air-dried).

Moisture	1·58
Organic and volatile matter	4·48
Mineral matter, soluble in acid, chiefly oxide of iron	15·01
Mineral matter, insoluble in acid, chiefly sand	78·93
	100·00

Lime	only present in traces.
Nitrogen	·075
Sand (approximately)	30·8
Clay, organic matter, &c. (approximately)	19·2

Its chief deficiencies are humus and nitrogen, though in the mineral constituents of plant food it might also be enriched to advantage. Lime is present only in traces, so that an application of marl, gypsum or lime in any form would undoubtedly give a profitable return. If wood-ashes were cheaply obtainable, we could not advise a more economical mineral fertilizer, for they supply potash, phosphoric acid and lime—all of which would increase the fertility of the soil. Instead of wood-ashes, a mixture of superphosphate kainit (the latter contains about 12 per cent of potash) may be used.

Regarding humus (vegetable matter), barn-yard manure, of course, would be most valuable, but as the supply of this material is no doubt limited the deficiency can be made good by the growing of clover alone or with grain crops. In this connection, it is gratifying to learn that this soil will grow good crops of clover. This is due, probably, to the potash, resulting from the ashes of the fire that passed over the district some years ago.

If there are any deposits of muck in the district, the farmers should be advised to utilize them. After digging and piling the muck it should be allowed to weather and air-dry by exposure. It will then form an excellent absorbent to use about the farm buildings and in the barn-yard. In this way much valuable liquid manure will be saved and the inert plant food in the muck rendered available. The resulting manure will prove most valuable to soils of this character.

Being a light soil, it would not be advisable to plough too deeply, but where there is a sub soil of clay within easy reach of the plough I should advise a judicious admixture with the surface soil.

This soil appears to be very similar to a sample sent by Mr. Wm. Wilson, from about six miles west of Port Arthur, the analysis of which appears in the Farm report for 1894. Unfortunately, this sample was destroyed in our disastrous fire in 1896, so that no comparison can be made as to the appearance of these two soils.

FERTILIZERS.

SWAMP MUCK.

From the correspondence and the number of samples of this material received for examination during the past year from farmers in the Dominion, it is evident that the testimony given in former reports of this Division regarding the value of this naturally-occurring fertilizer has attracted attention to many of the muck deposits of Canada. Since, however, we have in previous years devoted considerable time to the analysis of swamp mucks, and being much pressed with other work, these samples have not been submitted to a complete chemical examination. Sufficient work in most instances was, however, done to enable the writer to forward a preliminary report to the sender as to the general character and value. As time permits, these samples, or such as are from districts from which samples have not hitherto been sent, will be analysed and the results published in the annual report.

The following table presents the composition of six samples that have been analysed the past year.

ANALYSIS OF SWAMP MUCK (AIR-DRIED), 1898.

No.	Locality.	Sender.	Nitrogen.		Organic and volatile matter.	Sand and clay.	Mineral matter soluble in acid.	Water.
			Per cent.	Pounds in one ton of air-dried material				
				Lbs.				
1	Georges River Station, N.S.	John McMullen...	2·34	46·8	62·87	15·28	9·37	12·48
2	" ..	" ...	1·77	35·4	52·75	27·41	10·48	9·36
3	" ..	" ...	1·33	26·6	38·01	40·26	12·99	8·74
4	Churchill, Ont...........	F. A. Rogerson...	1·04	20·8	40·59	1·70	8·02	49·69
5	Little York, P.E.I........	J. H. Gill........	2·11	42·2	55·84	24·22	8·98	10·96
6	"	"	1·49	29·8	78·91	4·22	4·88	11·99

Nos. 1, 2 & 3.—It will be noticed that the chief differences between the samples lie in the proportion of vegetable and mineral matter, and that as the organic matter decreases, so does the nitrogen. Since this latter element is the one of greatest importance in mucks, the samples receive their value in the order given. All three specimens would make fair absorbents and prove useful for composting purposes.

No. 4.—A very fair sample. If further allowed to dry by exposure it would make an excellent composting material.

Nos. 5 & 6.—Usually, the amount of vegetable matter is a measure of the nitrogen present; such, however, in this instance is not the case; that with the largest amount of organic matter contains the least nitrogen, and *vice versa.*

Although swamp muck contains considerable quantities of plant food—and especially of nitrogen—we would remind farmers that this plant food needs preparation before it can be of any service to growing crops. By exposure in the pile, the muck is "weathered" and dried. It is then in a excellent condition to use in conjunction with litter in the cow-house, pig-pen, &c., indeed, everywhere about the farm buildings where

there is liquid manure to absorb and retain. It will also prove a valuable addition to the manure heap, keeping the mass moist, and thus controlling fermentation. When thus further decomposed by rottting manure, the manurial value of the muck is much increased.

For a more detailed account of the methods of treatment and uses of muck the reader is referred to reports of the Division of Chemistry for 1896.

BASIC SLAG: THOMAS' PHOSPHATE.

This comparatively new phosphatic fertilizer is now extensively advertised in Canada, and consequently many inquiries have been received regarding its nature, composition, value, etc. To furnish this information the following short article has been written:—

In the manufacture of steel by the Bessemer process a slag is formed rich in phosphoric acid. It is, in fact, chiefly, basic phosphate of lime. This by-product (it was until recently also a waste product) produced by the union of the phosphorus of the iron with the lime of the flux employed, is reduced to a fine powder and put upon the market as an agricultural source of phosphoric acid under the name of Gilchrist Thomas' Slag, Basic Slag, Thomas' Phosphate, etc. Without any further treatment it is applied to the soil.

Basic Slag contains from 15 to 20 per cent of phosphoric acid. In the Report on Fertilizers by the Department of Inland Revenue (Bull. 55), March, 1898, analysis of two samples are given, as follows:—

Basic or Thomas Slag.	No. 820.	No. 848.
Total phosphoric acid	16·76	16·25
Total available phosphoric acid	5·93	7·80

It also possesses a certain amount of free lime.

As regards the availability of its phosphoric acid it may be said to rank next to superphosphate, for though not immediately soluble in water, it is readily soluble in dilute acids. For this reason we may suppose it to be easily acted upon by the exudations of rootlets and absorbed.

Many agricultural chemists place the phosphoric acid in Basic Slag on a par with the "reverted" phosphoric acid in superphosphate. Extensive experiments in Germany by Wagner and others have established its value for all crops requiring phosphoric acid; this value is approximately estimated at one-half that of superphosphate. Wagner recommends for ordinary crops an application of 500 pounds per acre.

It should always be bought on analysis, and since its usefulness depends upon its fineness, farmers should see that they buy only that which is in the form of an impalpable powder.

It can be used in mixtures with nitrate of soda and the German potash salts without detriment, but should not be previously mixed with sulphate of ammonia, as such would result in the loss of valuable nitrogen.

Basic Slag responds best on peaty soils, soils that are sour through insufficient drainage, soils rich in humus and those deficient in lime.

SOUTH CAROLINA ROCK.

This is another phosphatic fertilizer that has found its way on to Canadian markets, though as yet it has not received an extensive trial in the Dominion.

"Phosphate Rock" occurs naturally and in vast deposits in North and South Carolina, Florida and Georgia. Two varieties may be recognized, the so-called "river" and "land" phosphates. The river phosphate is dredged from the beds of rivers or taken from swamps; it varies from gray to black, and contains from 50 to 60 per cent of phosphate of lime. It is usually put upon the market in three grades. The "land" phosphate is of a yellowish colour, and frequently contains large percentages of iron and alumina.

These rock phosphates are ground extremely fine and sold as "floats," to be applied directly to the soil. The finer it is ground the more immediately will be its effect upon the crop. For most crops and under ordinary farming conditions we could scarcely advise the use of this untreated phosphate rock, even if finely ground, since but a very small percentage of its phosphoric acid is soluble, and its action is consequently extremely slow. Treated with sulphuric acid it makes excellent superphosphate—a fertilizer valuable for supplying immediately available phosphoric acid. The phosphoric acid in phosphate rock is rated at about 2c. per pound, making the selling price of material worth about $10.00 per ton.

WELL WATERS FROM FARM HOMESTEADS.

As in former years, a number of waters from farm wells have been examined in the Experimental Farm laboratories. The results obtained have already been reported in full to the senders of the samples, but it has been thought that the insertion in the annual report of the Chemical Division of the analytical data, together with a brief remark as to the purity or otherwise of the waters—as has been customary in the past—would be both useful for reference and valuable from an educational standpoint. In the following table the results of the examinations are given. These waters, received between 30th Nov., 1897, and 1st Dec., 1898, are, as will be seen, from many widely distant points in the Dominion. Of these, thirty per cent have been passed as free from impurity, sixteen per cent have been reported as decidedly suspicious, and fifty-four per cent have been condemned as dangerous to health.

The desirability, or rather the necessity, of pure water, if the health is not to be endangered, must be realized when we remember the very important part that the water we drink and consume in our food plays in the nourishment of the system. The body is made up largely of water, a man, weighing, say, 148 pounds contains about 90 pounds of water. The blood which bathes every tissue and which carries the digested food products to every part for the growth of bone, flesh and brain, and which constitutes about one twelfth of the body weight, is largely water The food is digested and assimilated by the aid of water. The waste products of the vital processes within the body are got rid of largely by means of water. All this water, the water that becomes part of our very selves, is the water we drink or take in our food.

The pollution so commonly found in the water of the farm well is of the nature of drainage from the barn-yard, stable, privy or some similar source, in other words, the contaminated water contains liquid excreta or matter dissolved by the rains from the solid excreta. The danger to the system from this may be considered as two fold. First, it acts as adirect poison. Though probably slow and insidious in its action, it nevertheless has a decidedly injurious effect, lowering the tone of the system, undermining the constitution and rendering it liable to catch any disease that may be prevalent, causing sick headache, nausea, indigestion and many disorders of the intestinal tract. Secondly, such polluted water is a most favourable medium for the growth and multiplication of those germs which are the cause of typhoid fever and other diseases caused by the microscopic organisms. Once such germs find an entrance into the well—and this is generally brought about by drainage from the excreta of patients, as for instance, suffering from typhoid—the water becomes a source of infection.

ANALYSIS OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1897.				
1	Strathroy, Ont	J. S.	Dec. 6	·02	·05	6·672	26·0
2	Colborne, Ont	J. A. S.	" 10	Traces.	·16	4·18	136·0
3	Rockburn, Que	W. J. M	" 27	1·075	·6	·045	1·0
4	Hazel Hill, N.S.	P. McK	" 27	·63	·096	1·573	22·6
5	"	W. L.	" 27	Free.	·07	1·139	7·8
6	St. Henri de Mascouche, Que	Rev. E. P. J	" 30	·274	·020	2·238	2·0
			1898.				
7	Gladstone, Man	H. W. T	Jan. 5	·032	·112	·019	11·0
8	Westbourne, Man	P. C	Feb. 7	2·246	·90	4·271	230·0
9	St. Henri de Mascouche, Que	Rev. E. P. J	" 25	Free.	·052	1·460	·76
10	Almonte, Ont	J. K. D., No. 1	Mar. 3	"	·032	4·860	70·0
11	"	" No. 2	" 3	Trace.	·024	1·98	2·20
12	Purpleville, Ont	E. B.	" 4	·636	·156	·0198	34·0
13	South Wentworth, Ont	W. G. W	" 26	·120	·072	1·043	4·4
14	Nelson, P.O., Halton, Ont	A. E. A	" 26	Free.	·08	6·95	230·0
15	Chelsea, Que	J. H.	" 26	"	·080	4·061	31·0
16	Strathroy, Ont	J. S.	" 28	·032	·028	None.	·60
17	Chelsea, Que	J. H.	April 5	Trace.	·08	3·462	63·0
18	Cartwright, Man.	R. J. C. S	" 9	Free.	·384	11·183	116·0
19	Rockland, Ont	Wm. G.	" 23	·03	·44	·44	4·0
20	St. George, Ont	T. W. C	May 9	·06	·024	·082	3·8
21	Hintonburg, Ont	Wm. B.	" 19	Trace.	·128	1·573	13·0
22	Rockliffe, Tp. Nepean, Ont.	J. T. F.	June 9	03	·085	·387	3·0
23	Souris, Man	McC. & H	" 18	2·09	·075	·156	325·0
24	Wyoming, Ont	R. W.	" 20	·025	·21	·088	210·0
25	Sydenham, Ont	A. G., No. 1	" 23	·195	·373	·037	1·5
26	"	" No. 2	" 23	·17	·08	1·518	4·0
27	Riverside, Albert Co., N.B.	H. A. T.	" 23	·02	·063	·035	3·5
28	Bervie P.O., Kincardine, Ont.	J. G	" 24	·045	·139	18·641	31·0
29	Billings Bridge, Ont	H. E.	" 27	·095	·10	·189	35·0
30	Rathwell, Man	L. B	" 28	·02	·25	·033	105·0
31	Grenfell, Assa, N.W.T.	Dr. G. E.	" 29	·40	·325	1·57	11·0
32	Dalesboro, Assa., N.W.T	J. H. C.	July 13	·02	·10	·016	1·25
33	Kirks Ferry, Que	G. G. K.	" 15	·057	·145	·049	·4
34	Curran, Ont	A. B	" 15	5·013	·428	·068	4360·0
35	Powell P.O., Carleton Co., Ont.	S. S. H.	" 15	·02	·055	1·795	8·5
36	Minnedosa, N.W.T.	R. P. F	" 25	·51	·295	·198	15·0
37	Alexandria, Ont	E. A. H	" 26	·02	·09	·031	4·5
38	London, Ont.	J. S. P	" 30	·268	·10	·718	1·40
39	Chelsea, Que	H. B. P	Aug. 8	·05	·265	4·685	16·2
40	Glacier, B.C.	Dr. J. F	" 13	·018	·027	·0246	·10
41	The Brook, Ont	A. G	" 13	6·55	·198	·0568	4400·0
42	Chelsea, Que	A. B. H., A	" 18	·03	·263	3·426	27·0
43	"	" B	" 18	·024	·157	8·10	102·0
44	Glacier, B.C.	Dr. Wm. S	" 23	·018	·037	·0447	·10
45	Port Sydney, Ont	J. F. C., No. 1	" 23	·036	·12	2·676	7·6
46	"	" No. 2	" 23	·021	·132	4·20	19·2
47	Sussex, N.B	S. W. & E. Co	" 26	·092	·08	·0971	2·5
48	Middlechurch, Man	R. R. T.	" 30	·096	·139	·196	54·0
49	Ameliasburg, Ont	J. S	Sept. 1	·352	·174	·830	68·0
50	Chelsea, Que	J. H.	" 2	·026	·092	2·1198	7·5
51	Crossland, Ont	R. A. L	" 8	·38	·60	·044	14·0
52	Alberton, P.E.I	W. B. D., No. 1	" 10	·02	·076	2·708	62·0
53	"	" No. 2	" 10	·02	·036	2·643	55·0
54	"	" No. 3	" 10	·02	·032	2·11	59·0
55	Plaisance, Que	F. H.	" 14	·02	·317	·062	74·0

WELL WATERS, 1898.

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
489·2	323·2	166·0	Traces	Considerably polluted ; unwholesome.
1068·8	784·8	284·0	Very heavy traces	Seriously polluted ; dangerous to health.
193·0	....	....	....	Probable organic pollution.
160·8	104·8	56·0	Heavy traces	Undoubtedly polluted.
50·8	22·8	28·0	Slight traces	Suspicious.
58·8	18·8	40·0	Free	Decidedly suspicious.
618·8	384·8	234·0	Traces	Pure.
2166·0	970·0	1196·0	Heavy traces	Most seriously polluted.
52·0	32·0	20·0	Traces	Pure.
646·4	326·4	320·0	Heavy traces	Most seriously contaminated.
406·0	266·0	140·0	Slight traces	Probably a safe water.
466·0	254 0	212·0	Traces	Polluted.
416·0	286·0	130·0	"	Suspicious.
1205·2	681·2	524·0	Very heavy traces	Polluted.
268·0	116·0	152·0	Traces	Contaminated.
256·0	190·0	66·0	Large traces	Pure.
....	....	....	....	Contaminated.
2374·0	1536·0	838·0	Slight traces	Seriously polluted.
110·0	70·0	40·0	Heavy traces	Free from pollution.
886·0	714·0	172·0	Slight traces	Free from organic impurity.
306·0	210·0	96·0	Heavy traces	Free from pollution.
272·0	186·0	86·0	None	Pure.
1538·0	1458·0	80·0	Traces	Seriously contaminated.
656·0	562·0	94·0	"	Wholesome.
375·0	227·0	148·0	Heavy traces	Decidedly impure.
240·4	150·0	90·4	Traces	Seriously contaminated.
130·0	79·6	50·4	Slight traces	Free from all organic pollution.
558·4	294·0	264·4	Heavy traces	Undoubtedly polluted.
269·6	172·6	97·0	Traces	Polluted.
4188·0	3640·0	548·0	Slight traces	Mineral water free from organic pollution.
3209·0	2711·0	498·0	Traces	Polluted.
257·6	164·0	93 6	Heavy traces	Free from pollution.
53·5	32·5	21·0	Slight traces	Not contaminated.
9601·0	9112·0	489·0	"	Mineral water not suited for household purposes.
432 0	358·0	74·0	Traces	Polluted by drainage.
2265 6	1865 6	400·0	Very heavy traces	Most seriously polluted.
220·0	127·2	92·8	Traces	Free from pollution.
223·2	166·4	56·8	"	Seriously contaminated.
261·2	170·0	91·2	Heavy traces	Polluted.
16·8	12·0	4·8	None	Pure.
9004·0	8506·6	497·4	Slight traces	Mineral water not suited for household purposes.
279·6	208·0	71·6	Traces	Polluted.
448·8	275·2	173·6	Slight traces	"
1·6	0·0	1·6	None	Pure.
188·0	85·0	103 0	Traces	Polluted.
190·0	60·0	130·0	None	Seriously contaminated.
70·0	46·8	23·2	Traces	Suspicious.
888 8	626·4	262·4	Slight traces	Decidedly suspicious.
488·4	356·4	132·0	Traces	Seriously polluted.
163·5	109·5	54·0	"	Contaminated.
647·6	400·0	247·6	None	"
461·6	341·6	120·0	"	Suspicious.
364·8	230·4	134·4	"	"
470·8	342·0	128·8	Slight traces	"
980·0	796·0	84·0	Heavy traces	"

ANALYSIS OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1898.				
56	South March, Ont	G. H. Y	Sept. 17	·024	·088	4·114	36·0
57	"	Rev. W. H. S	" 17	·03	·113	3·62	34·0
58	Ste. Anne de Bellevue, Que	J. W. M	" 19	1·774	·40	2·922	14·8
59	Pickering, Ont	S. W	" 21	·142	·128	1·414	30·0
60	"	E. B.	" 21	·098	·066	·166	34·0
61	Port Sydney, Muskoka, Ont	J. F. C., No. 1	" 21	·056	·092	·517	·44
62	" "	" No. 2	" 21	·72	·212	·166	1·6
63	" "	" No. 3	" 21	·02	·04	·655	5·4
64	Yorkton, N.W.T	F. A. R	" 23	2·465	9·93	·1812	760·0
65	Hull, Que	Rev. C. B	" 28	Free.	·26	·237	1·9
66	Fenaghvale, Ont	J. G. D	Oct. 7	13·67	·24	·69	5520·0
67	South March, Ont	C. M. C. F.	" 10	·016	·223	·645	10·2
68	"	Wm. G	" 10	Traces.	·06	2·121	18·8
69	"	M. S.	" 10	·03	·133	1·785	88·0
70	"	J. A	" 10	·01	·04	·795	5·0
71	"	Rev. W. H. S.	" 10	·96	·25	3·669	51·6
72	Merrivale, Ont	A. A	" 18	Traces.	·135	None.	·1
73	Lakeview, Ont	H. G. M.	Nov. 8	4·22	·06	"	700·0
74	Souris, Man	McC. & H	" 9	2·745	·025	·463	328·0
75	Portsmouth, Ont	M. H. G	" 22	·110	·349	6·352	16·5

The well located in the barn-yard or near the privy, really acts as a cesspit. The water, and with it the organic filth in the soil of the vicinity is drawn into the well, since water always seeks its lowest level. This is true no matter how impervious the soil is through which the well is dug—though of course the time elapsing before the well is polluted depends upon the character of the soil and the amount of drainage matter. The number of our farm wells which are true springs, that is, in which water is received from a distant subterranean source, is not large. The common practice, then, of sinking the well about the farm buildings is one that we must strongly condemn, for it is sacrificing, or at all events jeopardizing, health to convenience. It would be much wiser and safer to put the well in the front of the farm-house than at the back, as is now the custom.

We are constantly being asked if such contaminated water cannot be purified and rendered harmless and wholesome. Our reply is that by far the safest plan is to abandon such a well and seek another where there is no danger of infiltration of filth. But until this can be done, the only safeguard is to previously boil all water used in the house. This destroys the poisonous compounds and kills any harmful germs that may be present. The ordinary household filters are practically useless for this purpose. Freshly boiled water is flat and insipid to the palate, but if it is allowed to cool in the open it becomes brisk and pleasant again from re-absorption of air.

The following suggestions and advice are offered to those who are interested in this important subject :—

1. If possible, utilize a spring or pure stream some distance from the farm buildings, and if gravity cannot be used for bringing the water in pipes, a windmill pump or ram, neither of which are expensive affairs now-a-days, should be employed. If, however, it is necessary to sink a well, place it at a sufficient distance from all source of pollution as to be beyond possible contamination. No matter how impervious the soil may appear to be, never sink the well in the barn-yard, under a building

WELL WATERS, 1898—*Continued.*

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
531·2	382·4	148·8	Traces..............	Seriously polluted.
439·2	278·8	160·4	"	Polluted.
642·8	464·4	178·4	Heavy traces	Seriously contaminated.
392·8	276·8	116·0	Traces..............	Polluted.
435·2	314·4	120·8	Slight traces........	Contaminated.
54·4	....	....	....	Good and wholesome.
96·0	....	....	....	Contaminated.
56·0	....	....	....	Suspicious.
53676·0	47100·0	6576·0	Very slight traces...	Exceedingly bad.
260·4	184·0	76·4	Slight traces...... .	Free from sewage pollution.
10294·4	9891·2	403·2	Very heavy traces...	Contaminated.
223·2	186·4	36·8	Traces..............	Free from contamination.
296·0	240·0	56·0	Heavy traces	Polluted.
568·8	374·4	194·4	Very heavy traces...	Contaminated.
247·0	172·0	75·0	Slight traces........	Free from pollution and wholesome.
531·2	375·2	156·0	Traces..............	Polluted.
270·0	201·6	68·4	Slight traces...	Free from sewage pollution.
2339·0	2177·0	162·0	"	Saline water not suited for general household purposes.
1539·2	1471·2	68·0	Heavy traces	" " " "
1401·6	1178·4	223·2	"	Contaminated.

containing animals, or near the privy or the back door. Convenience should be sacrificed, but health should not be jeopardized. Put the well in the front garden rather than in the back yard.

2. Surface and local sewage water should be kept out by lining the well with brick or stone work, laid in cement, to the ground water line. Glazed drain tiles of a foot or so in diameter, cemented together at the joints, make an excellent well, and are not costly.

3. The well should be protected by a closely fitting top, protecting slightly above the level of the ground.

4. The well should be examined and cleaned periodically—frogs, rats, mice, &c., frequently find therein a watery grave.

5. Garbage, household slops, and the like, should never find a resting place near the well. Their proper place is in the compost heap. The habit of throwing both solid and liquid waste outside the back door is both dangerous and wasteful.

6. The well should never be used as a cold storage receptable—accidents will happen. Neither should the milk cans, &c., be washed at the well, unless there is a very efficient drainage therefrom to carry to a safe distance the waste water.

The subject of cleanliness about the farm buildings is intimately connected with that of pure water, as well as that of economy in fertilizing material ; but in this connection I shall only say at present this : that air-dried swamp muck is an excellent absorbent and composting material. Deposits of this naturally-occurring fertilizer are to be found on many farms, and in many localities where such is not the case, it may frequently be obtained for the expense of hauling. It is a material rich in nitrogen, and, therefore, valuable in itself. Its free use in and about farm buildings, where there is liquid manure to be absorbed, will be found profitable, and, at the same time, valuable in keeping the surroundings healthy, and, possibly, the well water pure.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(James Fletcher, LL.D., F.R.S.C., F.L.S.)

1898.

Dr. W. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report on some of the most important subjects which have been brought officially under my notice during the past season.

As in former years it is, of course, impossible and unnecessary to treat in the annual report of the Division of many subjects which have required attention by the Entomologist and Botanist and his Assistant during the year. The correspondence has increased considerably and is of a varied character; there were 2,771 letters received and 2,906 sent out.

I have had several opportunities of studying important outbreaks of injurious insects and noxious weeds in the field and of attending meetings in widely separated parts of Canada, where it has always been my endeavour to bring prominently before farmers the work which is being done for them in my Division. These occasions have been of inestimable service to me in learning the different conditions prevailing and the methods of farming in vogue in the various parts of the Dominion.

The experiments with grasses and fodder plants have been continued and are always of great interest to visitors. It is satisfactory to be able to record the great success which has attended the extensive introduction of Awnless Brome-grass into the arid regions of the West. Where it has been tried in the East it is also spoken of very highly and is a heavy producer of excellent fodder and hay.

McIver's Rye-grass or Western Rye-grass, a form of *Agropyrum tenerum*, Vasey, found wild in Manitoba and cultivated for some years by the introducer, Mr. K. McIver, of Virden, Man., has given most satisfactory results as a hay and pasture grass. Mr. S. A. Bedford, Superintendent of the Brandon Experimental Farm, who has grown it for many years has always spoken of it in the highest terms. This is also the case with Mr. Angus Mackay, at Indian Head, and with some others who have tried this grass.

Of many mixtures for permanent pastures, grown together under the same circumstances, that known as the Experimental Farm Mixture has again given the best results. This mixture consists of: Timothy, 6 pounds, Meadow Fescue, 4 pounds; Orchard-grass, 2 pounds; Kentucky Blue-grass, 1 pound (where the ground is low, add 1 pound of Red Top); with the above sow the following clovers: Common Red, 1 pound; Mammoth Red, 1 pound; Alsike, 2 pounds; Lucerne, 2 pounds; White Dutch, 2 pounds. The above quantity of seed is for one acre.

Some rather important experiments have been begun along the Ottawa River in the province of Quebec to utilize the swampy lands in places subject to denudation or drowning out during the spring freshets. Mr. C. D. Tylee, of Ste. Thérèse de Blainville,

has been very successful in seeding down some land of this nature which had been broken up and from which the surface soil was carried away or much impoverished by the overflowing of the river in spring.

Another series of experiments is being carried on at the suggestion of Dr. T. Christie, M.P., near Lachute, where there is now a large tract of shifting sand, some five miles in length by about half a mile to one mile in width. The provincial Government of Quebec has encouraged the farmers and assisted them in planting trees. Many of these have done well, and the farmers being all interested are working hard to bring back this tract to what it was only fifty years ago, a beautiful undulating forest land. For the last few years the desert tract has spread very much, the shifting sand drifting over good farm lands and rendering them useless. Several sample packages of seed of the Awnless Brome-grass have been distributed, which it was advised to mix with white clover and sow among the trees. As this land was within quite recent times covered with trees and as all the farmers around it are keenly interested, there is every reason to hope that if all will keep on doing a little every year, planting trees and sowing grass and clover, in time the encroachments of the sand will cease, and the land will be brought back again to usefulness.

Several thousand specimens of plants and insects have been sent in for identification from naturalists in all parts of the Dominion. From these collections several additions have been made to the museum. Many rare and valuable specimens have been added through the kindness of Mr. J. R. Anderson, the Deputy Minister of Agriculture for British Columbia, and from my own collections in British Columbia and the Rocky Mountains during the past summer.

Subjects requiring special attention since I last reported were the following :—

The Rocky Mountain Locust and wheat insects among the enemies of cereal crops; these are treated of fully in this report. Root maggots did much harm throughout the season to cabbages, turnips, radishes and onions.

Of fruit insects, particular mention may be made of the San José Scale and many other scale-insects sent in by correspondents who had noticed them in looking for the San José Scale. The efforts which have been made to control and prevent the spread of the San José Scale, have been so far successful that it may still be said, I believe, that none of our Canadian nurseries are infested, and, as no nursery stock is now allowed to be imported from infested countries, there is every reason to hope that Canada will soon be free from this terrible scourge of the fruit growers to the south of us.

An unusual outbreak was of the Green Fruit-worms on fruit trees in Western Ontario and on maple trees at Niagara, and near Ottawa at Aylmer and Hull, Que.

Tent Caterpillars were enormously abundant in nearly every province of the Dominion, and no important occurrence of parasites was noticed except in British Columbia, where the caterpillars died in large numbers about the time they began to spin their cocoons.

Plant-lice were very destructive to cherries, currants and turnips. This last named attack on turnips was very severe in Manitoba and also in Ontario, where it constituted one of the chief injuries of the year to field crops.

The apples in British Columbia were much injured by the Apple Fruit-miner and by a small moth which has not been much mentioned of late years but which many years ago, under the name of Plum Moth, was described as destructive to plums in Illinois. It also attacked plums as well as apples in British Columbia this year. I have no doubt that the caterpillar of this moth is the one which has frequently been erroneously referred to by British Columbian correspondents as the Codling Moth.

In the province of Quebec a serious and rather remarkable outbreak was by the Plum Curculio in apple orchards at Chateauguay Basin, the fruit being much distorted and rendered unfit for the market.

A few new insect pests must be mentioned :—

In British Columbia the larvæ of an extremely rare longicorn beetle, *Xylocrius Agassizii*, Lec., were imported as borers in the stems of young gooseberry bushes from Oregon. This insect I hope and believe is not likely to become a serious pest.

In New Brunswick the larvæ of a sawfly belonging to the genus *Lyda* occurred abundantly upon raspberries at St. John. There is no mention in literature of a similar attack, but several larvæ are wintering in our breeding jars and it is hoped that the perfect insect will be reared next spring and the species identified.

In Ontario, considerable injury was done in beds of violets, grown by Mr. J. Dunlop, the well known florist, of Toronto, by the larvæ of another sawfly, *Emphytus Canadensis*, Kirby. These false-caterpillars have been complained of occasionally in the past as attacking the foliage of pansies (*Viola tricolor*, varieties), but no great injury by them has been previously recorded.

The Bean Weevil, often mentioned as injuring stored beans in the United States, has this year been found at Strathroy in Ontario.

Meetings attended.—Under the instructions of the Hon. Minister of Agriculture and in accordance with plans made by you as Director, I have taken part in several important meetings during the past year. In January last I attended a convention of fruit growers, nurserymen and official entomologists at Washington, D.C., to discuss the question of legislation with regard to the San José Scale. During the same month, farmers' meetings were attended at Lachute and Cowansville, Que. In February, a series of several meetings was held in New Brunswick in company with Mr. W. W. Hubbard, of Sussex, N.B., and Mr. J. E. Starr, of Nova Scotia, who had just returned from England, where he had been examining into the transit and sale of Canadian fruit. This series ended with a grand convention at Fredericton. On the 24th and 25th of the month meetings were attended in Montreal and at Huntingdon, Que. On May 7th I visited Lachute to examine grass experiments. On June 15th a large farmers' pic-nic was attended at Farrelton, Que. June the 16th and 17th were spent in the Niagara district, driving with Mr. Geo. E. Fisher, the energetic San José Scale Inspector, who has done excellent work in detecting and destroying trees infested with the San José Scale.

On June the 27th I left for the West: the first half of July was spent in the province of Manitoba, holding meetings in company with Mr. Hugh McKellar, the Chief Clerk of the provincial Department of Agriculture. There is probably no one better informed as to the history of the development of Manitoba and its requirements than Mr. McKellar. I, therefore, obtained much valuable information from him with regard to the capabilities of the province. The subjects treated at the several meetings were all in connection with weeds and the legislation relating thereto. The meetings this year were held in parts of the province not visited by us during the two previous years. The subject of weeds is of great interest throughout Manitoba and the Territories. It was a great satisfaction to me to notice a decided improvement in the condition of the farms in this respect since four years ago. This must certainly be credited to the vigorous policy adopted by the Hon. Thomas Greenway, the Minister of Agriculture, and his Deputy, Mr. McKellar. A popular feature of this year's campaign was the establishment of a Weed Tent at the Winnipeg Exhibition, where large bundles of all the weeds of the province were exhibited. This tent was always under the charge of some official from the provincial Department of Agriculture, and I was able myself to be present for the first three days. This exhibit may fairly be said to have been thronged by inquiring farmers who wished to examine the specimens or brought with them weeds to be named and to get advice as to their treatment.

On July the 20th I joined Mr. J. R. Anderson, the Deputy Minister of Agriculture for British Columbia, and travelled with him continuously till August the 8th. Through Mr. Anderson's intimate knowledge of the country, no time was lost and a much larger number of meetings was held than could otherwise have been the case. He being also an enthusiastic botanist, assisted me very much in procuring many valuable specimens of rare plants. By many acts of kindness he added much to the pleasure of my visit.

On my way back to Ottawa, in response to a telegram from the Hon. J. H. Ross, Commissioner of Agriculture for the North-west Territories, I stayed off at Regina, and addressed a meeting of farmers upon weeds and their eradication. This meeting, of which Mr. Gerald Spring-Rice was chairman, was fairly well attended and considerable interest was shown in this important subject.

With the consent of the Hon. Minister of Agriculture, I had the pleasure of preparing for the Hon. J. H. Ross, a Bulletin on the Worst Weeds of the North-west Territories. This bulletin of 29 pages and containing many illustrations, has been widely distributed and has been received with favour by North-west farmers.

While in Manitoba in the beginning of July, and again on 16th August, I had an opportunity of investigating an occurrence of the Rocky Mountain Locust. The outbreak had been referred to in several newspapers, and there was much anxiety among farmers. I was pleased to be able to detect a great many parasites and to explain through the newspapers the true state of affairs; at the same time farmers in the infested district were advised what should be done to avoid a recurrence of the injuries experienced this year.

I returned to Ottawa on 20th August. On the 8th September I attended a meeting at Toronto of the new Canadian Horticultural Society, and delivered an address on fungous diseases and insect pests. The 7th and 8th of November were spent at Lachute and Ste. Thérèse examining the progress of grass experiments, and on the 9th November I attended the annual meeting of the Entomological Society of Ontario in Montreal.

Acknowledgments.—I am under many obligations to kind friends and scientific specialists for much assistance. Mention must first of all be made of my colleagues, Prof. John Macoun, and Mr. W. H. Harrington, of Ottawa, also of Rev. Dr. Bethune of Port Hope, Ont., for valuable help on many occasions, as well as of the following who have extended many courtesies and furnished me with their invaluable publications:—

Dr. L. O. Howard, United States Entomologist, and his staff at Washington, D.C.; Dr. J. B. Smith, of New Brunswick, New Jersey; Professor W. G. Johnson, of College Park, Md.; and Professor T. D. A. Cockerell, of Mesilla Park, N. Mex., for special identification of insects; Professor L. R. Jones, of Burlington, Vt., and Mr. J. Dearness, of London, Ont., for the identification of many plants and fungous diseases. I must again thank my kind friend, Miss E. A. Ormerod, for her continued interest in our work and much valuable advice always freely given.

In conclusion, I beg again to acknowledge the great help I receive continuously in all branches of the work of the Division from my assistant, Mr. J. A. Guignard, B.A.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

CEREALS.

The season of 1898 has been a very anxious one for the farmer in Canada. From all quarters correspondents have reported unusual climatic conditions with extremes of heat and drought or low temperatures and heavy rainfall. On the whole, the wheat crop of the Dominion at the end of the season turned out better than could have been anticipated. In British Columbia, with its diverse climates, the small grains gave good returns, particularly on Vancouver Island, in the rich lands along the Fraser River and in the Okanagan Valley. From the North-west the accounts both as to quality and yields are very satisfactory, notwithstanding almost unprecedented rains after the grain was cut. Mr. Angus Mackay, Superintendent of the Experimental Farm at Indian Head, says at the end of September: "From all parts of this district the wheat crop is better than was expected. The lowest yet reported is 28 bushels per acre on stubble land, while many have over 30 bushels per acre. The crops on summer-fallow run from 30 to 45 bushels per acre. There will be an average of from 30 to 35 bushels per acre." In the Manitoba *Crop Report* of August 22, we find: "Perhaps in no year in the history of the province has the productive nature of our soil been so noticeable as the present season. Seeding time was unusually favourable, but for a month or six weeks after seed was sown there was no rainfall. In many fields seed did not even start to grow until late in June, so that, up to the first week in July, prospects were far from promising. A change came during the second week in July, when hot, growing weather gave crops a good start.

"From that time to maturity conditions were favourable. After this, however, another six weeks of cold wet weather set in, from which the wheat suffered considerably. This loss varied much in the different sections of the province, and is variously estimated at from 1 to 33 per cent of the crop. The best reports were from the North-central, South-central and Eastern districts. In the South-west, particularly north of the Turtle Mountains, the crops suffered much from want of rain, and in restricted areas from the ravages of the Rocky Mountain Locust. Some fields never recovered, but others picked up in a most remarkable manner, giving the whole country a strange patchy aspect. The spring drought, followed by rain and growing weather, brought on a copious second growth of grain which, from lack of moisture, had been unable to germinate in the spring."

Mr. Wm. Scott, of the McKay Milling Co., Ottawa, who purchases large quantities of grain both in the Province of Ontario and in the West, says: "The wheat crop this year throughout the Province of Ontario was of exceptional quality, the grain being clean, hard and heavy, some samples grown in the Ottawa valley going 64½ pounds to the bushel. We have received from our correspondents no complaints of attack by weevil or any other insects. The wheat from Manitoba and the Territories is this year of exceptionally good milling quality. The weed question, however, is still one of enormous importance in the Prairie Provinces, and notwithstanding all that has been done, even more effort will have to be put forth by our western farmers in sowing clean seed and weeding their crops, if they hope to maintain their grades of hard wheat and to get the best prices in foreign markets."

In the Ontario *Crop Report* for November, 1898, we find: "Fall wheat: poor yields were exceptional, and large yields were common. The plumpness of the grain is frequently alluded to, in many cases the weight going over the standard and as high sometimes as 63 or 64 pounds to the bushel. Here and there only did correspondents complain of rust, midge or other injury to the crop. The yield is 24 bushels per acre. The acreage of spring wheat is only a little over one-third of that of fall wheat. The crop has been over an average in yield and the quality good."

In the eastern parts of the province of Quebec and through the Maritime Provinces the reports are less statisfactory, rust being frequently complained of; oats, barley,

rye and buckwheat were below the average. The early summer months were very favourable to growth, but the autumn being rainy and foggy had a bad effect on nearly all crops.

"Alberton, P.E.I.—The wheat was very badly rusted, totally ruined in some sections, much damaged everywhere. I never remember a season since I began to make observations when the grains were so universally rusted. The Campbell's White Chaff wheat was being pretty generally sown and this kind suffered most, although no kind was exempt. This was all the more regrettable since the whole crop was so promising. Up to the harvest all went so as to cause us to expect an extraordinary return; such a growth of straw and such fine roots we seldom see; but then came close, damp weather suited to the spread of rust, and the whole province was afflicted with the evil. Besides this we have a short crop of potatoes, and even turnips are not up to the average. The hay crop alone was good, extraordinarily so; but, owing to the great quantities everywhere available, it sells at only half figures. A very moist season like the past advances growth here in this sandy loam of the island wonderfully, if it does not continue too late; if it does, all grain crops are subject to rust. There is this to be remarked, which might well be expected, however, that in these years of blight those who farm intelligently, manure and work well the soil, escape very much better than the makeshift farmers. I would estimate the farm crops of the whole province, as follows: Wheat, a quarter crop; oats, a half crop; potatoes, a half crop; turnips, an under crop; hay, an extra crop."—[Rev. Father Burke.]

"Pleasant Grove, P.E.I., Sept. 9.—All wheat in this section, with the exception of White Russian, is a failure, with rust, maggots or blight. Harvest is about over with us now, all wheat being housed."—[Edward Wyatt.]

WHEAT INSECTS.

It seems strange that there should be so much lack of knowledge and confusion with regard to the few insect enemies of such an important crop as wheat. The different kinds of wheat insects are few in number and unlike in appearance, but there is no crop with regard to which for purposes of exact identification it is so necessary to see specimens of the pests complained of as in the case of wheat. The words weevil, fly, maggot, joint-worm, rust or blight are made to do service for almost any insect or disease which may occur. The chief insect enemies of wheat in Canada in the past have been the Wheat Midge, the Hessian Fly, the Wheat-stem Maggot, the American Frit-fly, the joint-worms, and the Grain Aphis. There are of course some others, such as wireworms, cutworms, and the Wheat-stem Sawfly, which attack the wheat plant occasionally or locally, but the above mentioned are those most frequently inquired about and which, therefore, are of most interest to wheat growers.

With regard to WIREWORMS, which are sometimes the cause of much injury to grain crops, unfortunately it must be acknowledged that up to the present no practical remedy has been discovered. The only agricultural treatments which have proved beneficial are late fall ploughing and sowing infested land to rye or barley which it is claimed that wireworms do not attack badly.

It may be convenient for reference to give a very brief account of each of the worst pests.

THE WHEAT MIDGE or "Weevil" (*Diplosis tritici*, Kirby).—Several small reddish maggots crowding around the grains of wheat in the ear and causing them to shrivel. Some of these when full-grown fall to the ground and pass the winter beneath the surface. Others remain in the ears of wheat and are harvested with the grain. The eggs are laid in June among the flowers of the wheat, being pushed down between the chaff by means of the long slender ovipositors of the females. There is only one brood in a season.

Remedies.—(I.) Burn all rubbish and screenings from the threshing machine. (II.) Plough deeply as soon as the crop is carried.

Formerly this insect was enormously abundant in the older provinces of Canada, so much so that wheat growing was given up in many sections. Of late years the Wheat Midge almost entirely disappeared from Ontario until the present season, and, although mentioned occasionally by correspondents, no specimens were submitted or those sent in proved to be something else. Wheat Midge injury is probably more wide-spread in the Maritime Provinces just now than in any other part of the Dominion. Mr. Wm. O'Brien, of Windsor, Hants Co., N. S., writes: "The wet weather forced the hay and grain to make very rapid growth. But the grain did not appear to fill well, especially wheat and oats. Wheat only about two-thirds filled and very much affected with weevil." At Middle River, Victoria Co., N.S., there was also slight injury by Wheat Midge.

A restricted but severe outbreak of this insect occurred during the summer of 1898 in the Niagara peninsula, Mr. A. T. Small writes:—

"Beamsville (Lincoln Co., Ont.).—I send you a packet of Wheat Midge sifted from one gallon of tailings, some from each of my two neighbours. One of these, Mr. Tufford, a reliable farmer of long experience, who remembers the Midge when it was so bad here 25 or 30 years ago and who has done most of the threshing in this locality, estimates the damage at about 25 per cent. He says that all fall wheat had Midge more or less, Dawson's Golden Chaff and Seneca suffered most. Spring wheat was not affected, but little is grown here. Goose wheat and White Fife were sown last spring."

Mr. Wolston Small, of Ottawa, who spent the summer of 1898 in the Niagara peninsula, saw the Wheat Midge larvæ "so abundant at the time of threshing that the ground beneath fanning mills was quite yellow." He reported the insect as very destructive all along the lake shore in the county of Lincoln.

Fig. 1.—The Hessian Fly—enlarged and natural size.

The Hessian Fly (*Cecidomyia destructor*, Say).—This insect has been at different times the cause of serious injury to the wheat crop of all the older provinces, covering practically the same area as the Wheat Midge. The adult is a very small sooty two-winged mosquito-like fly about $\frac{1}{8}$ of an inch long (Fig. 1). The females lay their minute reddish eggs singly or in clusters on the upper side of the leaf. The young white maggots as soon as hatched work their way down to the bases of the leaves, those of the autumn brood becoming imbedded in the crown of winter wheat, and those of the summer brood at the base of the first or second joint of the stem under the leaf sheaths; there they attack the stem, weakening it so that it very easily breaks down at the point where the injury occurs.

When full-grown the outside skin of the maggots hardens and turns dark brown in colour, when they bear a very close resemblance to small, slender flax seeds, for which reason the pupal stage is frequently spoken of as the "flax seed" stage (Figs. 2 and 3). There are two broods in the season; the flies from the autumn brood which winter over in fall wheat appear in May and June, together with some of the flies from the first summer brood which did not emerge in the autumn; the flies of the autumn brood appear in August and the early part of September. The change from the maggot to

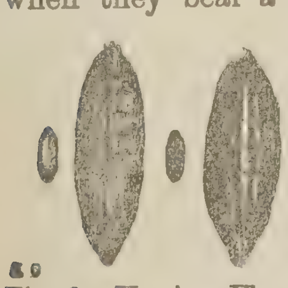


Fig. 2.—Hessian Fly: pupa-cases or "flax seeds"—natural size and enlarged.

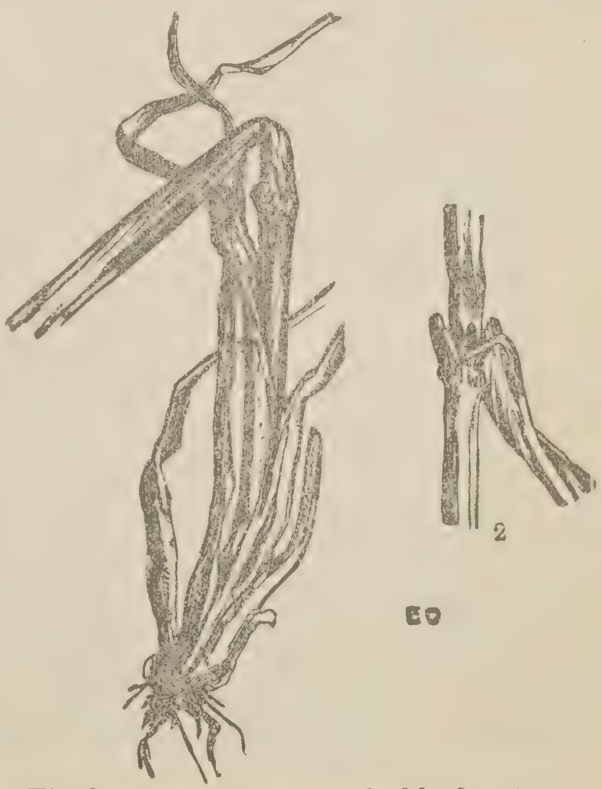


Fig. 3.—Hessian Fly: attacked barley stems: 1, elbowed down; 2, showing "flax seeds."

the pupal condition takes place inside the brown hardened skin of the flax-seed-like pupa-case a short time before the fly emerges.

Remedies.—The remedies most relied on are: (I.) Late sowing. The postponement of seeding until after the third week in September delays the appearance of the young plants above the ground until all the Hessian Flies of the second brood are dead. (II.) Burning refuse. As a large proportion of the "flax seeds" are carried with the straw and at threshing are dislodged and thrown down beneath the machine among the rubbish and broken straw, it is of great importance to destroy all rubbish or screenings wherever it is known that grain has been infested. (III.) Treatment of stubble. As soon as the crop is cut, a harrow should be run over the field so as to start a volunteer crop from the grains which have dropped in harvesting. By the time the fields will require to be ploughed, many flies of the August brood will have emerged and laid their eggs on these plants. The eggs will thus be destroyed at the same time as many seedlings of weeds, when the land is ploughed in the autumn. If fields are conveniently situated away from barns, houses and stacks, much good may be done by burning over the stubbles before ploughing, for the pupæ occur, as a rule, at the first and second lowest joints of the stem. To facilitate burning, a little dry straw may be scattered lightly over the stubble. Should the Hessian Fly ever develop as a serious enemy of wheat in Manitoba and the West, where fall wheat is not grown, burning over and ploughing down of stubbles immediately the crop is cut, will be the best remedies. (IV.) When it is found that a young crop of fall wheat has been injured by the Hessian Fly, it is a good plan to apply the following spring a light dressing of some quick-acting special fertilizer.

The worst attacks by the Hessian Fly which have come under my notice this year have been in Prince Edward Island, and in the province of Ontario in the counties lying between Lake Ontario and Lake Huron. References to injuries by the Hessian Fly in the province of Manitoba were, as far as I could learn, erroneous, although this insect may at some time be expected to appear there also as an injurious species, for Prof. Otto Lugger finds it in Minnesota, in the Red River valley, where the conditions are similar to those of a large part of Manitoba, he says: "A large area is infested, especially the western part of Central Minnesota from Brown's Valley to the Mississippi River at St. Cloud. Further north and south the fly is found in lesser numbers, and only a few occur in the northern part of the Red River valley and along the Iowa State line. The damages in some places amounted to more than 25 per cent, in others to 5 per cent and less, but on an average our farmers lost from 5 to 10 per cent of their entire wheat crop." (Otto Lugger, *2nd Ann. Rpt.*, 1896.)

"Pleasant Grove, P.E.I., Sept. 9:—I send you two samples of infested straw, one from my own field and the other from my neighbour's, which fell down badly this year. There were only a few plants in my field which fell down this season. Since learning from your reports the history of these pests, I have grown good crops of wheat by sowing late and dressing the land with a coat of good manure. My crop this year is a good one, the straw is as yellow as gold and almost free from rust."—[Edward Wyatt.]

Mr. Wyatt kindly supplied me with several samples of infested wheat straws and also with many stems of grasses from a field which had been badly attacked by Hessian Fly. Among these it may be mentioned that two stems of Timothy grass (*Phleum pratense*, L.) contained undoubted puparia of the Hessian fly. This was a matter of considerable interest to me because from the statement made in Miss Ormerod's well-known *Manual of Injurious Insects* I have frequently endeavoured to find traces of the Hessian Fly in any of the wild grasses. The statement referred to (quoted from Dr. C. Lindemann, of Moscow, Russia) is as follows: "Two kinds of wild grasses subject to the attacks of Hessian Fly are Timothy grass and Couch grass. In 1887 the first named of these was found to be severely attacked in the Russian Government of Tambov, and Couch grass was attacked in the Government of Tambov and also of Woronetz; Couch grass was so severely attacked that in whole districts covered with this grass, it was destroyed." This statement is of interest because of its possible bearing on the question of the original home of the Hessian Fly. A species which attacked a wild grass so severely as

above mentioned would appear to be much more at home than where it attacked only a cultivated plant of exotic origin, such as wheat is in America.

From Mr. Wyatt's observations it would appear as though at least two or three different kinds of insects were attacking the wheat on Prince Edward Island.

Samples of Hessian fly were received from several other places on Prince Edward Island. One sample, which came through Mr. F. G. Nash, of the Charlottetown *Patriot*, and was taken from a field of wheat on the farm of Mr. Joseph Wise, was found to be very much parasitized by minute hymenopterous enemies.

THE WHEAT-STEM MAGGOT (*Meromyza Americana*, Fitch).—The presence of this insect in a crop of wheat is very easily detected in the summer time when the ears of attacked stems turn white before the rest of the crop ripens. This injury is known under various names in different parts of Canada, such as "white heads," "bald heads," "silver top." If these stems are examined, it will be found that the base of the topmost joint of the stem has been gnawed away by a slender glassy green maggot a quarter of an inch in length, pointed at one end and having black horny mouth parts; to this injury is due the dying of the heads before the grain ripens. In addition to the above, there is another attack on the wheat crop by the same insect, similar to that of the autumn brood of the Hessian Fly, in the root shoots of fall wheat; it also occurs in many kinds of wild grasses. There is besides an intermediate brood which feeds upon grasses and volunteer wheat and barley. The severity of the summer attack in wheat fields seems to vary very much in different years, according to the season. Occasionally the injured stems will constitute as much as 5 per cent of the crop. This was the case nine years ago in Ontario. When full-fed the larva of the brood which attacks the stems works its way up to the upper portion of the sheath and turns to a slightly flattened and very transparent green puparium, from which the fly emerges at the end of July and during August.

Fig. 4.—The Wheat-stem Maggot: *a*, egg; *b*, maggot; *c*, pupa; *d*, fly—all enlarged. (Figure by Prof. H. Garman.)

The perfect insects, of which three distinct broods appear at Ottawa, viz., in the beginning of June, at the end of July, and at the end of September, are active, greenish-yellow flies, one-fifth of an inch in length, with shining green eyes and three dark stripes extending down the back (Fig. 4*d*). The hind thighs are much thickened, and when the fly is at rest the fore part of the body is raised. Very soon after emerging, the sexes pair and the eggs for the next brood are laid. These are snow-white, spindle-shaped, beautifully marked with narrow longitudinal lines, some of which run into each other. These lines are connected with each other by much slighter transverse lines. When looked for, the eggs are easily seen on the upper sides of the leaves, owing to their white colour, although, of course, they are comparatively minute, about $\frac{1}{40}$ of an inch (Fig. 4*a*).

The Wheat-stem Maggot, which, owing to its attack at the roots of wheat, is also called the Wheat-bulb Worm, occurs all through Eastern Canada, and although the adult flies are enormously abundant in meadows and prairies all the way from northern Quebec through the Lake Superior region, Manitoba and the North-west Territories, its attacks in grain fields have not been complained of under its own name until last season, when it was discovered by Mr. George Greig, the Manitoba agent of the *Farmer's Advocate*, that this insect is the cause of a considerable part, at any rate, of the injury to wheat in Manitoba which has of late years attracted so much attention under the name of "dead heads". In company with Mr. Greig, I was able to confirm this observation at several points in the province of Manitoba during the past summer. There were, however, several stems of wheat which showed the "dead heads", in which we could find no injury by the Wheat-stem Maggot. Some of these stems in one locality had been bruised, without being broken down, by hail. In no case could I find any trace of fungus attack. From the observation of Prof. Otto Lugger, it appears that "dead

heads" are also caused by the attacks of a Frit-fly (*Oscinis soror*, Macq.), the maggot of which is described as boring inside the lower portion of the culm. Throughout the province, although many enquiries were made, there were far fewer complaints of "dead heads" this season than last.

Mr. Peter Elder, of Blyth, near Rounthwaite, Man., showed me all through one of his large fields where last year a serious loss occurred from "dead heads," and not a trace was this year to be seem. Mr. A. C. Hawkins, of Swan Lake, Man., cited in my last report, writes: "Sept. 10.—According to promise, I endeavoured to procure specimens of the larva causing damage to wheat, known as 'dead heads'; but the only sign of insect work I found was an empty cocoon a little over $\frac{1}{8}$ of an inch long and yellowish-white in colour. (Undoubtedly of Wheat-stem Maggot.—J.F.) There were very few 'dead heads' in the crop." Mr. George C. Mannix, of Stonewall, who suffered last year, also writes: "I am happy to say there are no 'white heads' in the wheat this year."

References to "dead heads" made by Manitoban farmers all speak of this injury as being a new one, and, judging from the behaviour of the Wheat-stem Maggot in Ontario, and in Manitoba during the past season, I think it may be confidently hoped that this is not going to be a constant source of loss to the wheat farmers of the West. The insect feeds naturally in the grasses of the prairies, to which under ordinary circumstances it will chiefly resort, and I believe that its attacks upon wheat occurring so occasionally are due to climatic conditions which are not likely to occur every year. Moreover, wherever I have collected the mature flies by sweeping the prairie grasses with a collecting net, I have invariably found large numbers of its special parasitic fly, *Cœlinius meromyzæ*, Forbes. Notwithstanding the above, however, Prof. Otto Lugger, of Minnesota, who has also studied it in his State, where in 1895, 1896 and 1897 it was common from the Red River valley to the central part of East Minnesota, says that it threatens to become in the future a serious enemy of their crops of small grain. "In some parts of the State the late sown rye, which had made but little growth during the autumn and which grew slowly in spring, was greatly damaged, in some cases to the extent of one-tenth of the crop. Wheat did not entirely escape, and the plants infested by the insects showed their presence by their small size and general weakly appearance."

Remedies.—(I.) Should the attack of the Wheat-stem Maggot increase seriously and its presence be shown by the "dead heads," certainly much may be done towards reducing the numbers of the next brood by sowing a drill or two of wheat or barley in close proximity to the infested fields. This should be sown as soon as the injury is detected, so that the young plants may be up in time to attract the females for egg laying. After the middle of August these strips should be fed off by sheep or ploughed down. All stubble should be harrowed as soon as possible after the crop is carried, so as to start a volunteer crop, which should be ploughed down early in September. The late sowing of fall wheat, where this crop is grown, could not profitably be delayed long enough to escape the egg-laying period of the last brood.

(II.) The application of special fertilizers as a top dressing when young wheat is known to be attacked, will help injured plants to throw out new stools and overcome to some measure the effects of the attack.

THE AMERICAN FRIT-FLY (*Oscinis carbonaria*, Loew.).—The maggot of this enemy of the wheat is only $\frac{1}{12}$ of an inch in length and yellowish-white in colour. These maggots may be found in autumn destroying the bases of the stems of several kinds of grasses and of fall wheat. They also occur in spring wheat and grasses in June, attacking the young root-shoots close to the ground and either destroying or seriously weakening them. Some eight or ten years ago the American Frit-fly was the cause of extensive and widespread loss in Canadian wheat fields, but since that time hardly a mention of it has been made by correspondents; nor have its attacks been noticed

Fig. 5.—The American Frit-fly—enlarged.

on grain crops at Ottawa. In 1890 this insect was very injurious in Kentucky, and was well worked up by Prof. H. Garman, who published an excellent bulletin thereon under the name *O. variabilis*, Loew. (*Bull. 30, Ky. Ag. Ex. Sn.*) Prof. Garman writes: "I think it very likely that the *Oscinis carbonaria* of Coquillett's notes is the *O. variabilis* observed by you and me in 1890. I never felt quite satisfied with the determination. The flies were abundant here at that time, but have not been seen since." The life history in many particulars agrees with those of the Wheat-stem Maggot and the Hessian Fly, but there is still some uncertainty as to the range of variation in its habits. Such part of the life history as had been worked out up to 1890 is given in the Annual Report of the Experimental Farms for that year. In Prof. Lugger's Second Report, 1896, what is apparently an allied species is described with the important difference of habit that the larva bores inside the stems of wheat causing them to break down, and before that producing the appearance known as "dead heads." This attack was not observed at Ottawa when the American Frit-fly was so abundant, but the family to which this insect belongs is one which is remarkable for the diversity which is found in the feeding habits of the larvæ.

Fig. 6.—The American Frit-fly: pupa-case—enlarged.

Remedies.—The remedies for this insect are the same as those for the Hessian Fly, viz., the late sowing of fall wheat, the harrowing of stubble (or in the West the burning over or ploughing down of stubble), and the application of special fertilizers in spring.

As some of my correspondents have had difficulty in distinguishing between the American Frit-fly, the Hessian Fly and the root-infesting larvæ of the Wheat-stem Maggot, I quote from my annual report of 1890 the chief differences:—

"The three insects are easily distinguishable in all their stages. In the larval or maggot stages, in which they do all their injury to crops, they may be known by the following characters:—

1. *The American Frit-fly*:—Maggot long and slender, yellowish-white with two small but distinct black hook-like jaws. The last division of the body bears two little knob-like processes. Length when full grown $\frac{1}{12}$ of an inch.

2. *The Wheat-stem Maggot*:—This resembles the last named in shape and structure, but is conspicuously different by reason of its clear glassy green colour, and also by its much larger size, $\frac{1}{4}$ of an inch when full grown.

3. *The Hessian Fly*:—This is proportionately much broader than the other two, of a clearer white than the American Frit-fly maggot and nearly always shows a green stripe down the centre. Instead of the two hook-like black jaws which are present in the two previously mentioned maggots, the Hessian Fly larva has a horny forked organ sometimes called the 'breast-bone.' Length when full-grown, $\frac{1}{5}$ of an inch.

"In the chrysalis stages the differences are equally marked:—

1. *The American Frit-fly.*—The pupa-case is shaped as shown above (Fig. 6) and is of a pale chestnut brown.

2. *The Wheat-stem Maggot.*—Changes to a pale translucent pale green pupa-case (Fig. 4*c*).

3. *The Hessian Fly.*—The pupa-cases of this insect are of a deep rich brown, like small flax seeds (Figs. 2 and 3), and it is in this stage that farmers will most easily recognize the Hessian Fly.

"The perfect insects are very unlike. The American Frit-fly is shown at Fig. 5 very much enlarged. The colours are black and yellowish-white. It is a very small insect, large specimens being only $\frac{1}{15}$ of an inch in length. They are extremely active and hard to observe. The fly of the Wheat-stem Maggot is a slender yellowish-green fly $\frac{1}{5}$ of an inch in length, with three dark lines down the back, eyes golden green (Fig. 4*d*). The Hessian Fly is a delicate dusky gnat, well shown in Miss Ormerod's excellent figure where it is represented magnified and enlarged (Fig. 1)."

The JOINT-WORMS (*Isosoma*).—There are probably more species than one belonging to the genus *Isosoma* which attack the wheat plant in Canada. These injuries appear to be of rare occurrence, but have sometimes been serious in certain localities. In 1895 specimens of fall wheat infested by a Joint-worm were received from Meaford, Ont., on the Georgian Bay. This attack, although amounting to 5 per cent of the entire crop in the year named, has not occurred since. The galls made by this insect were almost entirely in the sheaths of the leaves and not in the tissues of the stems. Last year infested straws containing joint-worms were received from Mr. Wm. Welsh, of Verdun (Bruce Co., Ont.). Although from a district less than 100 miles from Meaford, and further, strange to say, although it is the only other report of noticeable injury by joint-worms to wheat which has been reported to me for some years, it would appear from the different nature of the galls which are entirely in the tissues of the stems and not in the leaf sheaths, that this occurrence may be of a different species of joint-worm. Mr. Welsh writes at the end of the season of 1898: "The joint-worm, which was so abundant last year has done little injury this season. I made many examinations for the insect but could find very little damage. In the grain after threshing there were very few of the hard broken pieces such as I sent you last spring. This disappearance, I think, may have been due to the very wet spring and early summer we had." Unfortunately, the exact identity of the Meaford specimens could not be determined; but, through the kind assistance of Mr. Welsh, who has sent several parcels of infested straw from Verdun, large numbers of the flies have been bred. These were chiefly from stubble collected in the spring, April 15, in a clover field, where they had lain on the ground from the time the fall wheat was cut the year before. Specimens of stubble from the same field, but collected in November, 1897, and broken joints from the stems taken from the threshed wheat which had been kept in breeding jars through the winter, failed to produce more than two or three specimens of the perfect insect, whereas the stubble which was left in the field all through the winter gave hundreds of specimens of the gall-former, all the females of which were winged like the males. Besides these there were two kinds of hymenopterous parasites. Specimens of all of these were submitted to Dr. Howard, so as to get an authoritative decision on the species.

Fig. 7.—The Joint-worm: galls on wheat stems—natural size; fly—enlarged.

Dr. Howard reports as follows: "The species is undoubtedly *Isosoma tritici*, Fitch (*nec* Riley). If you will consult my Bulletin 2, Technical Series, page 17, on Phytophagic Eurytominæ, you will find that this is the species called *I. hordei* by Walsh. I think Walsh's specimens also came from Canada. Among the material sent by you after it was mounted I found two species of parasites, viz., *Homoporus chalcidiphagus*, Walsh, and *Eupelmus epicaste*, Walker."

There are so many discrepancies between the descriptions of the galls and their modes of occurrence and with regard to important points in the life histories of the joint-worms that with a view to working out the identity of the different species I shall be pleased to receive specimens from anyone who may find his crops attacked by joint-worms. The galls will somewhat resemble the figure (Fig.7), given herewith or may be as in the case of the Verdun specimens mentioned above, merely hardened and somewhat curved portion in the straws of wheat, barley or rye.

Remedies.—There is only one brood of the joint-worms, and as they pass the winter in the straw, for the most part so near to the ground that a large proportion of the larvæ occur in the stubble left on the fields, they can be largely reduced in numbers by burning over the stubble or by ploughing it down deeply. The broken off hardened

pieces of straw observed in threshing and cleaning should be carefully gathered and burnt. Sometimes, as stated above, there are no galls formed, the presence of the larvæ causing merely slight swellings and the hard thickened condition of the straw. These portions break off in threshing and many are carried through with the grain. The threshed straw should be examined, and if the larvæ are found therein it should be destroyed either by feeding or some other consumption before the ensuing spring.

THE GRAIN APHIS (*Siphonophora avenæ*, Fab.).—The green, yellow, red or blackish plant-lice which are frequently seen upon all the small grains are well known by most farmers. These insects are found in some numbers every year and in occasional seasons increase to such an extent as to cause widespread alarm. Notwithstanding this general increase in numbers, it cannot be said that their attacks have ever materially decreased the wheat crop of the year, for they are invariably accompanied by various parasites which gradually increase in numbers and feed upon the plant-lice until most of them are destroyed. The two most numerous of these parasitic species in Canada are *Aphidius granariaphis*, Cook, and *A. obscuripes*. In addition to these there are always many of the leech-like larvæ of the Breeze-flies, *Syrphidæ*, which crawl about among the colonies of plant-lice and every day destroy large numbers, as they feed entirely upon plant-lice.

The Grain Aphis multiplies with great rapidity and the insects may be found of all sizes and colours all on the plants at the same time. The females bring forth living young continuously and these young lice are in a few days full-grown and themselves begin to propagate in the same way. There are no practical artificial remedies which can be applied on a large scale to fields of grain.

The WHEAT-STEM SAWFLY (*Cephus pygmæus*, L.), treated of at length in my report for 1896, has only been mentioned by one correspondent.

"Buffalo Lake, Moose Jaw, Assa., March 3, 1898.—I send a few heads of wheat such as appeared in one of my fields last year. This field was hailed out in 1896 and having been sown on summer-fallow the straw was burnt as it stood in the spring of 1897. A week or two previous to cutting, I noticed a great many straws and heads like those I enclose scattered loose among the grain, fully 5 per cent of the crop. You will notice that the heads were well developed at the time. Is this the work of the Wheat-stem Sawfly?"—[George S. Tuxford.]

It may be hoped, I believe, that the attacks of this insect upon grain will be only of an intermittent nature, for where the insect was abundant at Souris, in Southern Manitoba, no appearance of it has since occurred. Mr. J. Wenman writes me again this year that he has not heard of nor seen any trace of the insect since 1896. In company with Mr. Angus Mackay, I examined carefully the wheat fields around Indian Head, where I had collected specimens in 1895 and at the date the mature insects should have been flying, but although the standing grain was swept with a collecting net at all times of the day and in several different localities not a single fly could be found.

CUTWORMS in grain.—Occasionally considerable harm is done in grain crops by cutworms. There are several grass-feeding species in this large family which are liable to attack cereal crops. The injuries to Indian corn are well known and can be prevented to a large measure, but when a field of the small grains is attacked the only recourse is to adopt some agricultural treatment founded on the known life-history of the depredator. The exact identity, then, of the species is of importance, so that the life-history, if recorded, may be used as a guide to escape loss. An instance of the value of such information is found in the following correspondence:—

"Carleton Place, Carleton Co., Ont., May 26.—We send a box containing some cutworms. They have destroyed two fields of our oats. What can be done to prevent them from destroying all our crop? Would spreading lime over the field kill them, and how long will it be until they have passed away, so that it will be safe to sow some other grain or to plant corn on the fields where they ate the crop off?"—[J. Yuill & Sons.]

Reply: "Your letter of the 26th inst. containing cutworms from your oat field came to hand, but the cutworms had eaten each other until only one shrivelled up bitten

specimen remained alive. Please send me some more, and if possible in a tin box with plenty of food. There are two kinds of these cutworms much alike, and I cannot, from the specimen I have, tell whether they are of one which matures early, or of the other which does not reach full-growth sometimes till July. In this case exact identification is very important before I can advise you what crop to sow on your land. Corn for ensilage may, I suppose, with you be sown as late as 12th or 14th June, turnips up to 20th June and rape or Hungarian grass up to 1st July. Spreading lime would have no effect whatever on these caterpillars."

"June 2.—We send you another sample of cutworms, as requested, and have cultivated the field again. We are now waiting your answer to know when we shall be safe to sow again. If it would be safe to sow oats soon, we should prefer that crop."—[J. Yuill & Sons.]

Reply: "I am in receipt of your letter of the 2nd inst. as well as the cutworms sent. These are the Glassy Cutworm, the caterpillar of the Devastating Dart Moth (*Hadena devastatrix*, Brace). I have waited a day or two before answering your letter so as to be able to say—what I now believe to be the case—that you can sow oats safely on your land. If you have any convenience for turning chickens or turkeys on to the field for a day before the oats are sown, they would doubtless destroy large numbers of the caterpillars or their chrysalids. I shall be very much obliged to you if you will let me hear from you later in the season what success you obtain from sowing oats on this land so late in the season. You will, I suppose, probably cut them for green feed.

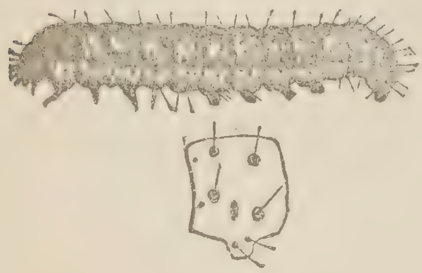


Fig. 8.—The Glassy Cutworm.

"The other cutworm referred to which resembles very much the Glassy Cutworm, but is whiter and has a redder head, is the caterpillar of the Amputating Brocade Moth (*Hadena arctica*, Bdv.), a species which also attacks the roots of grasses and grain. This caterpillar does not reach full-growth usually till after the middle of June."

"Dec. 28.—We broke up about 30 acres of sod land. The autumn before being so dry, we did not get it ploughed. Ten acres of this were sown in peas, the remainder was sown in oats. There were no cutworms in the peas, but all the oats that were sown on sod were eaten more or less. About ten acres was eaten clean out. Following your advice, we turned the turkeys and chickens on the fields and have no doubt but they would have cleaned the cutworms, had it not been that the crows took so many of the young chickens that we were obliged to bring them home.

Fig. 9.—The Glassy Cutworm Moth.

"On the eighth of June we sowed with peas and oats, about 3 parts oats to 1 of peas. This crop was not injured by the cutworms. We had a very heavy crop which we cut a little green and are using for fodder."—[J. Yuill & Sons.]

THE ROCKY MOUNTAIN LOCUST

(*Caloptenus spretus*, Uhler).

It is now some years since any serious injury has been reported in Canada by the Rocky Mountain Locust, although from time to time mention was made in newspapers of the temporary spread up into Southern Manitoba, of small swarms from parts of the Turtle Mountains in North Dakota, where the species breeds probably every year. Such was the case in the autumn of 1897, and the females were seen laying their eggs on the farm of Mr. John Scott, near Deloraine. From these eggs enough young locusts hatched in the spring of 1898 to cause considerable loss in grain crops. The season was

exceptionally dry, and there was no green thing in the country for the young locusts to eat except the settlers' grain crops. The injury of this attack was augmented by the fact that from lack of spring rains a large proportion of the seed grain had failed to germinate, and, consequently, all crops were very thin on the ground.

I visited the infested localities, in company with Mr. Hugh McKellar, Chief Clerk of the Manitoba Department of Agriculture, and drove with him to all the places at which it was known that locusts had been observed. None of the farmers, with the exception of Mr. John Scott, remembered seeing locusts in injurious numbers before. Considerable damage was done on the farms of Mr. J. H. Urie, Messrs. Leonard and Robert Sawyer, Mr. John Scott and Mr. D. S. McLeod. The farm of the last named is at Lennox, the most westerly point visited ; this is just round the spur of the Turtle Mountains from Deloraine. I was unable to visit some farms said to be infested near Boissevain, but through the kindness of Mr. Arthur S. Barton, of the Dingle, Boissevain, and Mr. Charles A. Sankey, of Boissevain, I was kept well informed as to the visitation and provided with specimens for examination. On my return to Ottawa and at the time when the farmers would have finished their harvesting and be at liberty to plough their land, I prepared the following article upon this important subject, and so that it might reach as many farmers as possible, sent it to the *Farmer's Advocate*, which has a very large circulation and which published it both in its Manitoba and its general edition. Similar articles were also published in the *Weekly Star* of Montreal and two or three in the *Winnipeg Free Press.*

THE ROCKY MOUNTAIN LOCUST.

During last June notices appeared in the newspapers that injury was being done by grasshoppers or locusts in southern Manitoba. These reports naturally caused much anxiety among the old settlers who had been in the Prairie Province at the time of the serious locust depredations during 1868, 1870, 1872, and 1874.

Fig. 10.—The Rocky Mountain Locust.

By instruction of the Honourable Sydney Fisher, and at the request of the Hon. Thomas Greenway, I visited the localities reported to be infested in the beginning of July and again in the middle of August. The reports of injuries to growing crops were found to be correct, and the locust which was doing the injury was, as in the former invasions referred to, the Hateful or Rocky Mountain Locust (*Caloptenus spretus*, Uhler).

The exact identification of the species was in this case a matter of no little importance, for it is well known that, although there are many kinds of locusts in the west, none of them are to be feared as crop destroyers to anything like the same extent as the above named, which has exceptional powers of flight and is gregarious in its habits. As is usually the case in such matters, when conviction on this point involved a good deal of extra labour, some farmers were slow to believe that such an ordinary-looking insect could be so serious an enemy as was claimed by those who recognized in the grasshopper of this year their old enemy of the early seventies, and doubts were being cast on the correctness of the identification. This question was at once decided upon catching a few specimens near Deloraine. To one who has studied these insects it is, of course, just as easy to distinguish the Rocky Mountain Locust from its near allies as it is for a farmer to tell wheat from rye, barley or oats.

A good use of this special knowledge was made by Mr. John Scott, who has lived a few miles south of Deloraine for many years. He noticed a swarm of the locusts to alight on his farm last autumn, and this spring warned his neighbours to be on their guard and take some steps to protect their crops, similar to those he himself adopted. As soon as the grasshoppers hatched he spread rows of dry straw across the field where they were most numerous ; the young hoppers gathered into these at night in large

numbers and were destroyed by the straw being set on fire after nightfall. This was repeated four nights running, and myriads were thus killed before they had spread far from their hatching grounds or had done any appreciable harm. Had Mr. Scott's neighbours followed his advice and example, there is no doubt that the loss would have been much less than was the case in that district last summer.

The area over which the Rocky Mountain Locust occurred in Manitoba this year was a narrow strip only a few miles in width, lying to the south of Deloraine and Boissevain, and running along the northern slope of the Turtle Mountains. It is probable that this locust breeds regularly every year in parts of the Turtle Mountains, but it is many years since it spread from these breeding grounds north into Manitoba. It has, however, shown only too well in previous years that it is able to breed and multiply on our prairie lands when once established there. As, therefore, judging from the experience of the last twenty years, it is unlikely that fresh swarms will for some time again spread from their permanent breeding grounds, it is of the utmost importance that everybody in the infested region should do everything possible to help in exterminating this formidable foe. This is particularly the case in the present instance, because if all will work together complete extermination should be a matter of comparative ease. The life habits of the insect are well understood, and the experience of farmers living in regions where it occurs much oftener than with us, shows that by making a very small change in the ordinary methods of working their farms, and at no very large extra expense, this dire enemy can be practically wiped out, even where eggs have been laid in enormous numbers.

WHAT TO DO.

It is conceded by all that the best remedy is the ploughing down of the eggs so deep—five or six inches is sufficient—that when the young locusts hatch in spring they may not be able to work their way up to the surface. The important things, then, for Manitoban farmers to do now are to discover where eggs have been laid on their farms and to see to it that every rod of this land is ploughed either this autumn or next spring before the young locusts emerge and move off into the crops.

WHERE THE EGGS ARE LAID.

The places where the mother insects lay their eggs can be discovered only by seeing them at work, or by examining the soil carefully for the egg-pods. The time required for boring the hole and laying the complement of eggs is three or four hours. The appearance of the insect itself, the pods and the separate eggs are well shown of natural size in Dr. Riley's excellent figure herewith.

Fig. 11.—Locusts laying their eggs.

The female locust lays her eggs in the ground, about an inch beneath the surface, in small pod-like masses, as shown in the figure. The egg-pod consists of a coating of a waterproof mucous material, which is deposited at the same time as the eggs. There are in each pod about 30 eggs, and each female lays about three pods during the autumn. There is only one brood in a season, the winter being passed in the egg. When the young locusts hatch, they emerge through the upper end of the egg-pod. In Manitoba last season the young hoppers were noticed about the 1st of June, but they probably hatched early in May, because it takes seven or eight weeks for the insects to attain full growth, and winged hoppers were abundant by July 8th at Deloraine.

The eggs are laid for the most part in stubble fields. They are very seldom laid in thick sod or in loose, newly-ploughed earth. In the first case it is difficult for the female to form the chamber in which she lays her eggs, owing to the numerous roots of the grasses, and in the second case the burrows could only be made with great difficulty in the dry, powdery earth. All observers report that eggs are rarely laid in newly-ploughed and well-harrowed land.

The late Dr. C. V. Riley wrote: "The egg may be laid in almost any kind of soil, but by preference they are laid in bare sandy places, especially on high dry ground, which is tolerably compact and not loose. . . . Newly ploughed land is not liked, it presents too loose a surface; but new breaking is often filled with eggs." (This is doubtless owing to the firm surface of the sod before backsetting.) "Sandy soil that is compact, especially when having a south or east exposure, is much chosen; but in loose and shifting sand the eggs would perish."

Prof. Otto Lugger, State Entomologist of Minnesota, writing in July, 1889, after examining a district which had been devastated, says as to the places chosen for egg-laying: "A close inspection soon revealed the fact that fields with last year's stubble contained large numbers of eggs, whilst stubble land of the previous year and older contained none or but very few. . . . There were some eggs in denuded spots of timothy fields; . . . where the timothy plants covered the ground entirely no eggs could be detected; a similar observation was made in pastures; if well sodded, no eggs; if bare of vegetation, a few could be detected. No eggs could be found in the native prairie land, and but a few along roads and the elevated beds of railroads."

In the Special Bulletin issued on this subject by the North Dakota Agricultural Experiment Station in 1891, it is stated: "As the eggs are never laid in thick sod nor in loosely ploughed earth, it will be seen that the ploughing need not extend to any land except the stubble fields."

From the foregoing extracts by three of the leading authorities on the subject, it is evident that if farmers will attend carefully to their stubble lands, where by far the greatest proportion of the eggs are laid, there is every hope that next year there may be no trouble from locusts; but, at the same time, it must be borne in mind that unless all help, there were certainly sufficient locusts this year in the district I visited, for the young to commit serious depredations next year, and to spread over a much wider area in the Province.

Remedies.

Ploughing.—The remedy above all others, as stated above, which has given satisfactory results is the ploughing down of the eggs, and although harrowing has been recommended by some, it cannot be relied on. Knowing the importance of giving definite advice to the farmers of southern Manitoba, I corresponded with the State Entomologists of Minnesota and North Dakota, both of whom have had extensive experience in fighting the Rocky Mountain Locust. I submit herewith quotations from recent letters giving most valuable information:

"St. Anthony Park, Minn., August 23.—Ploughing from 4 to 4½ inches deep is the only true remedy. It is not necessary to plough during the fall, though best; if ploughed early in the spring the surface of the field will become quite compact by rain, even by the wind. None or but very few young locusts will reach the surface, and these will starve before reaching plants upon which to feed. Permit no stubble fields. They should all be ploughed, as in them most of the eggs will be deposited. A few acres of stubble land can and will breed enough locusts to endanger the crops of all the surrounding fields. In the past I have repeatedly tried the plan of harrowing in the autumn instead of ploughing, and have invariably failed, since sufficient numbers of locusts hatched to destroy the crop. In fact, the trouble near Perham was almost entirely caused by a party who insisted on harrowing the fields containing eggs instead of ploughing them. He harrowed thoroughly during the autumn, but in spring I found numerous eggs and egg-pods. At my request he harrowed again in spring (would not plough) and seeded with a drill. This field was the principal one in which numerous locusts hatched and from which they migrated to others."—[Prof. Otto Lugger.]

"Agricultural College, N. Dak., Aug. 30.—There is no question as to the efficacy of ploughing. Fields lying side by side on the same ridge of land that were visited by Rocky Mountain Locusts last fall showed this point very clearly. One of the fields was left unploughed, and from this small area probably 250 bushels of grasshoppers hatched out, while in the fields that were ploughed no trace of grasshoppers could be found except as they came from unploughed fields. The farmers in parts of this State find that early fall ploughing gives a much better yield of wheat than either late fall ploughing or spring ploughing, and, for this reason, as well as for the destruction of the locusts, we recommend that all fields in the infested localities be ploughed as early as possible.

"So far as ploughing simply to destroy the eggs of the locusts, there is no reason why this need be done in the fall any more than in the following spring. In fact, in the localities where grasshoppers appeared this year, fields that were ploughed immediately before seeding were as free as those ploughed shortly after harvest, though the ground in both cases was undoubtedly filled with eggs.

"Now, in regard to harrowing, there is no doubt that if the egg masses are brought to the surface and broken at this time of the year the vitality of the eggs will be destroyed. The only question connected with harrowing is how thoroughly the egg-masses will be broken up. Where soil is firm I have recommended harrowing, and then cross-harrowing, so as to disturb every portion of the surface. The disk harrow used for pulverizing sod about five or six weeks after breaking would probably do good work if the ground is too firm for the ordinary harrow. The heavy rains which usually come in August and September here, compact the soil so much that ordinary harrowing would probably fail to serve the purpose. Disking the fields immediately after harvest would leave the soil in such loose condition that the insects would probably avoid that locality for egg-laying."—[Prof. C. B. Waldron, Horticulturist, N. Dak., Agr. Exp. St.]

To secure the best results as far as the destruction of the locusts is concerned, fall ploughing is undoubtedly the most effective method; but, if from press of other work it is impossible to plough all land which was under crop this year, much good may be done by early spring ploughing before the insects hatch or before they are large enough to move from their hatching grounds to adjacent crops. Stubble land which it is intended to summer-fallow next year must be turned down, if possible, before the 1st of June, and at the latest by the middle of that month.

Other Remedies.—Should grasshoppers, notwithstanding all precautions, be found abundant, farmers may have recourse to burning by means of strips of straw, as was done by Mr. Scott this year, or to the use of hopper-dozers or tar pans, which are implements made of sheet-iron, containing some tar or coal oil in the bottom. A cheap and

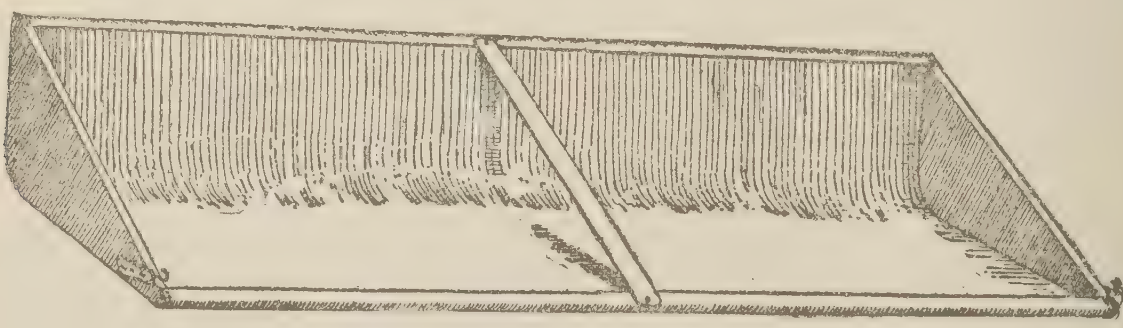


Fig. 12.—Grasshopper Dozer.

simple plan of one of these, costing from $1.50 to $2, was described many years ago by Prof. Riley. It consists of a strip of sheet-iron, 8 or 10 feet long, turned up 1 inch in front and 1 foot behind, with pieces soldered in at the ends (or made of wood) and hooks placed in front at both ends for the attachment of ropes. If to run on rough ground, it will be better to put runners, 1½ or 2 inches high, underneath Into this put a layer of coal tar ½ inch deep, or water and coal oil. The implement can be drawn by a boy at each end, or by a horse if preferred. (*Farmer's Advocate*, Winnipeg, 5 Oct., 1898.)

When examining the insects on Mr. Leonard Sawyer's farm a few miles south of Deloraine, on 8th July, Mr. Sawyer took me to a ravine where he had noticed a great many dead locusts lying among the grass. These were found to have been destroyed by the larvæ of a dipterous parasite. By digging down into the ground beneath the dead locusts, from 1 to 8 of these larvæ could be found, and the dead locusts were so numerous that they lay in every direction among the grass at a distance of only an inch or two from each other. Tachina flies and Flesh-flies were extremely abundant. Upon catching several of the locusts in both the pupal and the perfect stages, by far the larger proportion of them were found to contain the maggots of a fly, and in addition a great many of them were infested with locust mites, *Trombidium locustarum*, Riley. Although many of the maggots of the parasites had buried, none were found which had hardened into brown puparia. This was on 8th July, which may be considered the time when the first brood of maggots leaves the locusts. These latter were just passing the last moult and assuming the winged form. They were hanging in every direction from the stems of grasses, stretching their tissue-paper-like wings by means of their long hind legs. A box was filled with the parasitic maggots and from these were bred (22nd to 26th July), both at Ottawa and by Dr. Scudder, at Boston, large numbers of a flesh-fly which has been named through the kindness of Mr. D. W. Coquillett, of Washington, and pronounced to be "a species of *Sarcophaga* near *incerta*, Walker." They were bred from the living locusts, some of the larvæ being actually taken from insects caught flying in the field.

Dr. Scudder, who kindly furnished me with this identification, also named some other locusts taken at Deloraine among the specimens of *M. spretus*, as *Melanoplus atlanis*, Riley, *M. minor*, Scudd., *Camnula pellucida*, Scudd., and *Gomphocerus* sp.

Efforts were made during the past autumn to discover where eggs were laid and to secure specimens, but all to no avail. Many observers in all the infested localities tried to help me in this matter, but none could find that eggs had been laid. The weather was exceptionally dull and wet. Notwithstanding that no eggs could be found, farmers are earnestly urged to plough all the stubble land that is possible, and endeavour to do this before the middle of June, whether it is to be cropped or summer-fallowed. This matter is one of far too much importance for any one to run the risk of trusting to luck that all will be well, when so much is at stake. Although no eggs have been found, I observed the locusts copulating on 17th August, and large numbers of healthy females with their abdomens well filled with eggs.

I append extracts from letters referring to this outbreak in which most of the points of importance are brought forward :—

"Boissevain, July 9.—I received your letter respecting the locust invasion in southern Manitoba. I have made general inquiries and had extracts from your letter published in local papers. So far, no one has observed any parasitic destruction of the pests ; but that may have been from the fact that, soon after I reported to you, the colony which appeared close to the bush on two farms near here seemed to disperse in a northerly direction. Some were found three miles north of the point where they first appeared. Of course, in this scattered fashion no immediate or general destruction of crops has been observed, but the danger may be all the more serious for another year. I understand that extensive precautions are being taken to the south in the way of deep ploughing, &c."—[Charles A. Sankey.]

"Boissevain, August 14.—I have been unable to discover any number of dead locusts or any of the parasites you asked about. The swarm is now scattered over a distance of a five or six mile radius from the spot where they were first observed, in varying numbers ; we have them here in small quantities. I found one farm, near the bush, where small patches of the wheat heads appeared to have been stripped of the grains, and I discovered a few locusts and a number of several species of ordinary grass-hoppers in the grass surrounding the field. I hope you will discover from your investigations that the danger for next year is, after all, not so great as we fear, but I do trust that if there is any danger you will not minimise it in the least, as farmers are only too ready to put off the thought of an evil day, especially if they can avoid

thereby any present inconvenience or expense. There are a number, however, who are only waiting for your report to take energetic action, should you consider it necessary."—[Arthur S. Barton.]

"Boissevain, September 10.—I have not yet found any eggs of locusts. They are still pairing, and great numbers can be found on the lee side of the wheat stooks. Is there any distinguishing mark on the ground where they lay their eggs?"—[Charles A. Sankey.]

"Deloraine, September 14.—I met Mr. D. Steedsman to-day. He has his man ploughing the ground you advised him to, and the man reported that he had not seen a single grasshopper. Yesterday, Mr. Steedsman himself went with the plough all round the field and did not see a single grasshopper nor any trace of eggs. Per contra I have noticed several hoppers six miles north of Deloraine. There is one point which it may be of importance to mention: during the two weeks preceding Friday, 9th September, we had very unusual weather—cloudy, heavy fogs by night, occasional heavy showers of rain, one especially so on Friday, 2nd September, when for two hours we had a perfect deluge. On Thursday, 8th September, we had a sharp frost, since which the weather has cleared, but to-day (14th September) is again cloudy and threatening rain."—[Dr. Robert S. Thornton.]

"Boissevain, September 24.—"I have not been able to discover any locust eggs as yet, and I have delayed writing in the hope of finding some. There are locusts on nearly every stook of grain. They are still mating, but appear very sluggish, frequently being lifted on to the stack on the sheaf and not attempting to move; this is principally in cloudy weather. I have scraped and dug, and examined (and so have my friends and neighbours), but so far we have not discovered a single egg. Can you tell me, if not too late, if there is any indication or mark left on the surface of the ground that would guide one in looking for the eggs?

"I saw a pretty sight last Friday; a large flock of Black-headed Terns or gulls came swooping down the field; dividing at the leeward side, they ranged the rows of stooks to the other side of the field; returning with the wind in a body, they again and again quartered the field. I was near enough to see them picking the locusts off the stooks as they passed. I came to the conclusion that it was not their first experience, and it would be interesting to learn if their absence this summer was due to locusts further south (in Minnesota), or whether their usual breeding place at Whitewater Lake was too dry for them. In other years we have a constant procession of them backwards and forwards from the lake to the bush, and constantly they follow the plough, picking grubs and larvæ out of the freshly turned furrows."—[Arthur S. Barton.]

"Boissevain, October 22.—I have made a close search for eggs of locusts, but so far with no result. Mr. Barton has also been unsuccessful, though it seems almost incredible to think that none have been laid; apparently a disaster in the shape of a severe snow-storm and frost has destroyed them. I do not think more than one supply of eggs can have been laid."—[Charles A. Sankey.]

"Deloraine, November 14.—With regard to grasshopper eggs: I have not written to you sooner because I had no information to give you. I have scraped and looked on our wheat stubble and on my neighbours' fields and have seen but one female loaded with eggs and no eggs in the ground. I heard of some being found two miles north-east of here and I went there to get some, but I could not find any. Mr. David Steedsman said that they had all moved north from his place and he did not think that there were any eggs laid on his land. Mr. Leonard Sawyer says he saw numbers of small grasshoppers full of eggs. I caught lots of them, and a good many had those worms in them which you showed me when you were here. I do not think many eggs have been laid here, where we had them thickest last year. The grasshoppers seem to have moved north and east and cover more territory than they did last year. While some farmers have ploughed a good deal of land, the fall has been so backward and the harvest prolonged that people have, on the whole, done very little work. I believe we all intended to follow your instructions as much as possible, but now we are frozen up. I heard of eggs being found 8 miles north of Deloraine, through reading your description of them in the *Weekly Star.*

I may find some yet, and if I do will forward them to you without delay. I am very much afraid the province may have more hoppers next year than most people have any idea of. I know that Mr. C. A. Young was trying to get information to send you, but he has nothing definite, so has not written lately."—[John Scott.]

Another outbreak of locusts occurred in the Nicola Valley in British Columbia. This was brought to my notice by Mr. Hewitt Bostock, M.P., who also forwarded specimens for examination.

Reports were also received from Mr. Pooley and Mr. Sidney J. Solomon as follows :—

"Nicola Lake, B.C., September 7.—Yours received *re* grasshoppers. I am sending by this mail some grasshoppers and their eggs, which I hope will be of some use to you in determining the species. The injury done by the hoppers was principally to the ranges and bunch grass pasture fields: also considerable injury to the oats, by their eating off the small stem which connects the grain with straw, and consequently all the oats were lodged on the ground. Injury to wheat, not any; peas, scarcely perceptible. This is the second time the grasshoppers have appeared in our valley. The first time (which was in 1890) they made complete havoc, and unless something happens to destroy the eggs before hatching, it will be very little use putting in a crop next spring. The eggs are deposited on gravel and sandy hills (about an inch below the surface). Some of the eggs seem to have become dried, but the majority are quite fertile. Nearly all the grasshoppers have disappeared and a great many have died."—[William Pooley.]

"Nicola Lake, B.C., Dec. 31.—I could not grow enough feed to keep any quantity of hogs. The grasshoppers were very bad last summer and laid their eggs, so that we are expecting our crops will be all eaten by them next year. I shall put in very little wheat or oats, but principally peas and potatoes, as they do not bother these crops so much."—[Sidney J. Solomon.]

The early disappearance of the locusts mentioned by Mr. Pooley would indicate the probable presence of parasitic insects or some fungous disease. As it was important to know the exact identification of the species which were committing these depredations, the specimens received were forwarded to Dr. Scudder, who reported :—

"Cambridge, Mass., U.S., Dec. 2.—The mass of the material was a species of *Trimerotropis*, probably *cincta*, Thom. Out of the balance, I made out *Camnula pellucida*, Scudd., (many specimens), *Circotettix verruculatus*, Kirby, and *Melanoplus atlanis*, Riley."—[Dr. S. H. Scudder.]

The most numerous species was *Camnula pellucida*, which is sometimes extremely abundant and destructive in the West. This was the case between Kelowna and Vernon, B.C., in 1895.

In the case of this species, undoubtedly the use of hopper-dozers before the locusts have developed their wings would be attended with good results, and if, as is frequently the case with *Camnula pellucida*, the places chosen for egg laying are restricted areas, these may be treated early in June with much less trouble than later.

The poisoned bran remedy recommended for cutworms, page 190, has also been found very effective againts locusts in California.

When the eggs are found to be laid in cultivated ground, the ploughing of this in fall or spring would destroy all the young locusts contained in these eggs, and, if circumstances would permit of it, it might be tried in the Nicola Valley, by placing several small piles of the poisoned bran in the hatching grounds. This material seems to have a wonderful attraction for the locusts.

VEGETABLES AND ROOT CROPS

CUTWORMS.—The complaints of injury to garden vegetables and root crops have been this year fewer than usual, most references to the ordinary garden pests, such as cutworms, Tarnished Plant-bug, plant-lice, etc., being merely to mention their absence. In the province of Quebec, however, there was serious loss in some localities from cutworms, both in gardens and field crops. Very few specimens were submitted for examination, so only general instructions could be given. If correspondents would always send in specimens with their inquiries it would be far easier for the Entomologist and Botanist to give definite information and instructions, and he could thus be of more service to inquirers than is now sometimes the case when no specimens are forwarded.

"Quebec, June 14.—We are receiving from different parts of the province of Quebec letters informing us of the immense damage which is being done to vegetables by the plague of cutworms, against which our farmers do not appear to have any means of protecting themselves."—[S. Sylvestre, Secretary, Dept. Agr.]

"Causapscal, Rimouski Co., 30th May.—I am instructed by the Directors of the Agricultural Circle to send you the accompanying specimens of caterpillars which are occurring here in large numbers and eating up completely our peas, at first the stems and then even the seed pease in the earth. Farmers have been obliged to sow their fields of peas over again. Can you tell us where this pest comes from, how long it will continue to devastate our crops, what it will change to, and above all the best means of destroying it? If we are not able to check this plague, our crop will be a total failure." —[V. O. Morrissette.]

As specimens accompanied this inquiry it was seen at once that they were the so-called Black Army-worm (*Noctua fennica*, Tausch.) and had reached full-growth, so that the application of a remedy was not necessary. These caterpillars were also somewhat abundant in gardens at Ottawa, where they attacked every kind of vegetables, and also to some extent in clover fields. This insect is one which from time to time appears suddenly in large numbers, and then does a good deal of harm. In the last stage of its growth it is a voracious caterpillar which eats indiscriminately almost every kind of vegetation. Prof. Lugger, who treats of it under the name of the Erratic Army-worm, when recording an outbreak which occurred in the State of Minnesota, says that: "The caterpillars devoured every green thing upon the face of the ground. They preferred, however, such plants as were bitter, hence the foliage of cherries, willows, poplars and sumachs was the first to be eaten. After these nearly all others were devoured."

From my own observations of several occurrences of this insect at Ottawa I believe its natural food plants to be the Leguminosæ—cultivated peas and clover being particularly relished. The early maturing of the caterpillars (generally by the end of May or very early in June) frequently prevents the injuries of this insect from being as serious as they might be and actually often seem to be. In 1891 a three-acre field of peas upon the Central Experimental Farm was swept bare by an army of these caterpillars. The damage was stopped promptly by spraying a strip 50 feet wide ahead of the caterpillars with Paris green, one pound in 100 gallons of water, to which 4 pounds of soap had been added to make the solution adhere to the pease. This was applied with knapsack sprayers. Although the pea plants were eaten down entirely on three acres of the field mentioned, owing to the injury being done so early, the plants threw out fresh roots and gave actually a better crop than an equal area in the uninjured portion of the field.

Professor Lugger gives a similar instance in his Second Annual Report, as follows: "Nor was the actual damage done very great, as all the wild plants soon recovered and made a denser growth. The cereals which had been cut down to the very ground, assisted by the moist warm days which followed this invasion, not only recuperated but were in some cases even improved as they stooled better than those not cut by the worms."

The full-grown caterpillar is a handsome creature between $1\frac{1}{2}$ inches and $1\frac{3}{4}$ inches in length, cylindrical in shape, about $\frac{1}{10}$ of an inch in diameter. The general colour being velvety black, with white longitudinal stripes; head, red, black in front; legs, reddish. The dorsal area is more or less shaded with brick red; dorsal stripe of velvety black diamond-shaped marks; the lower edges of the dorsal area clearly defined by a black line, shaded beneath with an equally distinct white thread; sides dull-black, spotted with a few white points which hardly form a line. Spiracles black; sub-stigmatal band distinct, white and undulating, bearing in the centre a very ragged black line washed with yellow, the upper margin dipping below each spiracle and then running up considerably higher than it towards the posterior margin of each segment. Ventral surface semi-translucent, dusky, mottled with white, the green contents of the body showing through the thin skin. When full-grown, about the end of May, the caterpillars burrow rather deeply into the ground and turn to dark brown chrysalids from which the moths emerge about a month or six weeks later. The perfect insect is for a cutworm moth handsome, and all the markings are sharply defined. It expands about $1\frac{1}{2}$ inches across the wings. The upper wings are dark blackish-brown, the orbicular and reniform spots white, bearing a few yellow or reddish scales and outlined with black. In the male the inner margin of the upper wings is yellowish brown, by which this sex can be recognized at once. The lower wings are gray, darker at the margins. There is in Professor Lugger's Second Report a beautiful plate by L. M. Hart, showing the caterpillars, the chrysalis and the perfect moths.

Remedies.—When the Black Army-worm attacks field crops, remedial measures must be taken with due regard to the nature and condition of the crop to be protected. In all instances which I have seen when the caterpillars were abundant enough to march in swarms, it has been possible to forestall them by adopting the well known methods used against the true Army-worm, namely, running a deep furrow in advance of them, burning them in wind-rows of straw, or poisoning them by spraying a strip of the vegetation before they reach it, with a strong poisonous mixture. In gardens, they may be advantageously combated by the same methods used against other cutworms. Owing to their large size at the time when garden vegetables are very small, two or three caterpillars can in a single night work terrible havoc in young vegetables grown in rows. This was the case at Ottawa last spring where the larvæ of this species worked at the same time with the caterpillars of the White Cutworm (*Carneades scandens*, Riley, Fig. 13) and the Red-backed Cutworm (*Carneades ochrogaster*, Gn.) and all three species were particularly troublesome in radish beds.

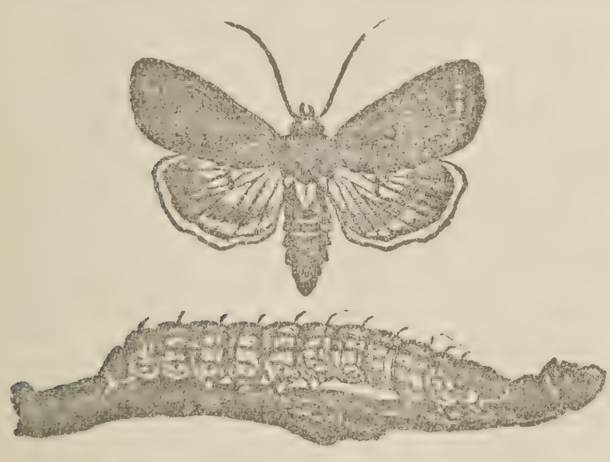


Fig. 13.—The White Cutworm.

THE WHITE-CUTWORM (*Carneades scandens*, Riley), "The Climbing Cutworm" of Dr. Riley, is an uncommon species at Ottawa and has not been sent in from elsewhere, although it is recorded as having done much damage to orchard trees in Western Ontario some years ago. The full-grown caterpillar measures about $1\frac{1}{2}$ inches in length. Its general colour is a pinkish white. The head, the thoracic feet and the thoracic and anal shields are yellowish-brown, dotted with minute black points The spiracles are deep black and the piliferous tubercles very dark, but not so black as the spiracles. This cutworm is easily recognized by its delicate whitish almost glaucous colouring. I was surprised to find it in large numbers at Ottawa in a garden with only two small poplar trees growing near. These were in no way injured, but it seemed as though the cutworms spread from a bed of Couch-grass (*Agropyrum repens*, Beauv.) which was growing at the base of one of these trees. The White Cutworm passes the winter about half grown, but in the piece of sandy land where the attack

referred to occurred some individuals did not revive until a surprisingly late date last spring, namely, the end of May. Some half grown specimens were dug from the bed of Couch-grass in November last. The moths expand about 1½ inches across the wings. The general colour of the forewings is pearly bluish-gray, tinged in some specimens with pink or brown scales; different specimens vary very much in distinctness of the transverse lines, but all show a well defined white subterminal line shadowed on the inner side by a row of dark triangular marks, and the reniform spot shows more distinctly than any of the other markings. Hind wings whitish, with a broad, pale fuscous band and discal spot. Head and body concolorous with the forewings.

Remedies.—When it is known that cutworms are abundant in gardens or even in fields, much can be done by the use of well-known and well tried remedies to destroy them and prevent injury. Several correspondents have borne testimony to the benefits of clean culture, by which all haulms, vines, stems and leaves of crops which had been gathered were promptly destroyed and the land kept free from weeds, so that the female cutworm moths when egg laying were not attracted to the spot. The banding of freshly set out annual plants, either with rings of paper or tin, has as usual given good results. An enterprising Ottawa firm, Messrs. Taylor and Gilbert, has put out a device made of a specially prepared stiff paper 10 inches long by 3 wide, called the Taylor Plant Protector for tobacco, cabbage, tomatoes, etc. These are stated to be a sure protection against cutworms, cold winds, light frosts, etc. The price, less than $1 a thousand, brings them within the reach of all. A great many were used at the Experimental Farm both in this Division and by the Horticulturist and were found to be extremely satisfactory. Cutworm injuries are of so much interest to every grower of vegetables, flowers and fruits in all parts of the Dominion, that I think it well to draw attention to the above device. I may mention that identically the same thing has been used for many years by Mr. George Thurber, of Upton Village, Que., to protect tobacco plants from frosts and cutworms.

The most striking results have been obtained from the use of the poisoned bran remedy, which consists of a mixture of bran and Paris green in the proportion of 50 of the former and 1 of the latter. In making this mixture (which may be applied either wet or dry) it is best to dampen the bran slightly with water containing a little sugar. After mixing thoroughly, so that the whole mass may be permeated very slighly with moisture, add the Paris green by shaking on a very little at a time and stirring it in. If the Paris green be added to the bran when it is perfectly dry, it will, owing to its weight, sink at once to the bottom when stirred. If it is desired to use this mixture as a wet application, more sugar and water must be added until it is of about the same consistency as porridge; but if to be used dry, a little more dry bran may be added until the mixture will run through the fingers easily. Mr. F. A. Sirrine, of Geneva, N.Y., drew attention to the fact that the mixture could be used dry with even better results than when applied wet. It is far easier to distribute and lasts longer without getting mouldy. A convenient implement for distributing this poisoned mixture, among crops which are grown in drills or rows, is a combined wheel hoe and seed drill. The seed box is filled with the poisoned bran, and lines of it are run across the field or along the rows close to the crop. In sandy land it was found convenient first to run a shallow furrow and then drop the bran into this shelter, which prevented the bran from being blown away by the wind. Strange as it may seem, it certainly appeared as if the bran mixture was more attractive to the cutworms than the living plants.

This remedy is, after all, only a modification of the poisoned trap remedy which has been used so successfully for many years, and which will continue to find favour with many, as green succulent vegetation suitable for the purpose is nearly always to be had, for it must be remembered that any weed will answer the purpose, whereas bran or shorts would have to be purchased.

THE CUTWORM LION *(Calosoma calidum*, Fab.*)*.—Cutworms have many enemies. In addition to various insectivorous birds and small mammals, there is a host of parasitic

Fig. 14.—Cutworm Lion beetle.

and predaceous insects which hunt them out and devour them. One of those most often inquired about is the Fiery Ground beetle (Fig. 14) and its voracious black grub, the Cutworm lion (Fig. 15). Specimens of these are sometimes sent in by observant correspondents. The beetle is a large showy and bold species, which is seen in pastures running about quickly and hunting for its prey. Too often, we fear, through ignorance as to its good offices it is destroyed by the many thoughtless people who seem to think that every insect seen should be stepped upon and killed. The appearance and habits of this good friend of the husbandman should be known to every one. The beetle is truthfully portrayed life size at fig. 14. It is a brownish-black beetle, having the wing cases spotted with coppery red in nearly all of the eastern specimens, although occasionally a green spotted specimen is seen. In British Columbian specimens the spots are almost invariably green, the red spotted form being exceedingly rare. Both as a perfect beetle and as a grub (Fig. 15) this insect destroys enormous numbers of cutworms. The following letter is similar to many others which have been received concerning this useful insect:

Fig. 15.—Cutworm Lion.

"Mattawa, June 25.—I applied to you last June for instructions how to fight the cutworm which had made a complete havoc of my garden, and I received your valuable treatise on insects that are destructive which gave me valuable instructions. I followed your advice and kept down weeds during the later summer and in the fall. After I got the crops off I cut all weeds in field corners, raked them up together with all potato tops and other refuse and burnt all; the result is that this year, while the cutworm has destroyed everything in my neighbours' gardens, they have troubled me very little; in fact, nothing to complain of, for of 2,000 plants transplanted, I have not had two per cent loss caused by the cutworms, and in plants grown from seed what little harm they may have done was not perceptible. I inclose you a specimen of a little insect that seems to be a mortal foe to the cutworms. One day recently I noticed a cutworm making very fast movements and contortions, so I picked it up and found one of these insects fastened to it just at the back of the head. I put both into a tin can and watched for the result of the combat. Several times I caused the insect to loosen its hold and placed each as far as possible apart; when the insect was let go it would immediately attack the cutworm again, always trying to fasten about the back of the neck. The result was that the cutworm was dead in twenty minutes. On Thursday last I found the inclosed specimen and then secured a cutworm and put both into a can, when the combat of the few days previous was renewed, with the same result. I put two more cutworms, one each time, into the can, and the black grub killed both."—[C. G. Hurdman.]

THE PEA MOTH (*Semasia nigricana*, Steph.).—In previous reports I have referred to the common injury to green peas, particularly the large late garden varieties, by the caterpillars of a small moth. During the past summer this insect was found in many districts, where it had doubtless always occurred, but from which no reports had been received. One of the localities where the insects has done most harm is Constance, in Huron Co., Ont. Mr. John McMillan, M. P., puts the loss in 1897 at no less than one-third of the crop. Up to the present no specimens of the moth have been caught in the field, but some specimens were reared in the insectary during 1897, which emerged between the 12th and 15th of July, and last summer three more specimens emerged at the same dates, namely, from 13th to 15th July. This would indicate that the natural time for egg laying is not till after the middle of July. Therefore, if peas are planted in good time and of early varieties—of which there are now several of high quality—good crops of green peas for the table can be secured before they are liable to be attacked by the caterpillar of the Pea Moth. At Ottawa several varieties of the small early peas can be picked by the first week in July, and the first crop of all the

best large varieties before the end of the month. The caterpillars of the Pea Moth would not be large enough to enter the pods and injure the green peas at earliest before the end of the month; consequently, at Ottawa and in localities with the same summer climate, green peas for the table can always be grown if early varieties are chosen and seed is got into the ground in good time. Mr. W. T. Macoun, Horticulturist of the Central Experimental Farm, has furnished me with the following list of what he considers the six best early varieties and of the dates when they were ready for picking:—

Alaska	June 17	Gradus	June 18
American Wonder	" 17	Nott's Excelsior	" 20
Gregory's Surprise	" 17	McLean's Little Gem	" 23

In his annual report for this year is given a list with dates of maturing of 25 of the best varieties of all kinds. Where peas are grown for the seed they will be injured in districts where the Pea Moth is prevalent. Experience would indicate that early sowing is in all cases advantageous, but it is also possible that late sowing, so as to hold back the podding, if possible, late enough to escape the season of egg-laying, might give a crop of uninjured seed.

THE PEA WEEVIL (*Bruchus pisorum*, L.).—This perennial pest is, year after year, the cause of enormous loss, notwithstanding the fact that millions of the beetles are destroyed every season in the "bug houses" of the large seed dealers. Prof. C. C. James says in his November *Crop Report*:—"Pease seem to have been the most unfortunate of the grain crops. The drought of the early part of the summer and a frost about the 10th July told upon the growth, and the bug made its appearance in nearly every section of the province. Some of those reporting are inclined to take a discouraging view of the outlook for pea growing, owing to this pest."

It is probable that there has been some confusion in the reports of which the above extract is a summary, between the injury of the Pea Weevil and that of the Pea Moth. The distribution of the Pea Weevil is very much more restricted than that of the Pea Moth, and there are large areas in the province of Ontario where the highest quality of seed pease can be grown without any danger of infestation by the Pea Weevil.

THE BEAN WEEVIL (*Bruchus obtectus*, Say).—*Attack.*—Small beetles closely resembling in shape and movements the Pea Weevil, but only half its size, namely, $\frac{1}{10}$ of an inch long, oval in form, with the head bent down and more or less concealed as seen from above, and prolonged into a short squarely cut snout. Antennæ distinctly jointed and enlarging towards the tip; the first 4 and the last joints reddish. The wing covers marked with ten impressed and dotted longitudinal lines. The whole body covered with short silky hairs. The lines on the wing covers are broken up into pale yellowish dashes and dark brown spots. The tip of the abdomen extends beyond the wing covers and is of the same reddish tinge as the tips of the antennæ and the legs, but is covered more or less with short silky hairs and bears a central white line, but there is no appearance of the two black spots which are so conspicuous in the Pea Weevil.

The life-history of the Bean Weevil differs in some important points from that of the Pea Weevil. The eggs of both are laid upon the pods while these are young and tender. On hatching, the young grub of the Bean Weevil eats its way inside and penetrates one of the forming beans, several grubs entering a single bean, each one forming for itself a distinct cell. They become full-grown and change to pupæ in the autumn and a little later to the perfect beetles. The date of emergence from the seed depends very much, as in the case of the Pea Weevil, on the temperature in the autumn months; it may be in the late autumn or not until the spring; when the seed beans are stored in a warm building, the beetles may emerge at any time through the winter. One of the important differences between the life-histories of the Pea and Bean weevils is that, whereas in the case of the former the young grubs can only enter the soft green seeds, those of the Bean Weevil can propagate for three or four generations in the dry stored seeds. This fact renders the well known domestic remedy for the Pea Weevil of holding over the seed for two years quite ineffective in the case of the Bean Weevil; that is, if a

bag of pease infested with Pea Weevil were put away for two years, the Pea Weevils would emerge the first spring and die in the bags. But, in the case of a bag of beans infested by the Bean Weevil kept in the same way, the beetles on emerging would at once set to work laying eggs upon the beans. The young grubs when hatched would penetrate the dry seeds and go through all their stages, and this breeding might be repeated as long as the supply of beans lasted. Curiously enough, the Pea Weevil does not bore holes through the paper or cotton bags in which infested seed has been stored, but in the case of the Bean Weevil such bags are readily perforated and the beetles escape,—frequently, when this happens in houses, as is sometimes the case, to the great consternation of the inhabitants.

The Bean Weevil seems to be a cosmopolitan species, the original home of which was in Asia. It was probably introduced into America through commerce and has been the cause of considerable damage in various States of the American Union. It has been mentioned in the reports of several United States entomologists, full articles being given by Professors Riley, Popenoe and Lintner. There has been a great deal of discussion as to the proper name of the species. The last decision seems to be that the beetle should be called *Bruchus obtectus* of Say. The Bean Weevil has never been recorded as an injurious insect in Canada until the present year, when I received from Mr. B. Gott, of Strathroy, Middlesex Co., Ont., specimens of the beetles and some seed beans which had been entirely destroyed for seed or food purposes. Each seed had been so perforated and the contents eaten away that it could be crushed with gentle pressure between the fingers. These specimens answered in every particular to Dr. Riley's description of *Bruchus fabæ* given in his *Third Missouri Report*, but authorities now consider that *B. fabæ*, Riley, and *B. obtectus*, Say, are identical.

Mr. Gott stated that the beans had been held over from the spring in strong paper bags and put away in a cool room. At the time of his writing, December, 1898, large numbers of the beetles had been found in his house. They were thought at first to be Pea Weevils, but Mr. Gott noticed that they were different, and after some search found that they came from the bags of beans, of which the paper was perforated with numerous holes.

Remedies.—As in the case of the Pea Weevil, the best remedy for this insect is the destruction of the weevils inside the beans as soon as possible after the crop is ripe. Fumigation with bisulphide of carbon is the best treatment in every way. It must not be forgotten that this liquid and its vapour are very dangerous to use, owing to their extreme inflammability. The most convenient way to fumigate seed is to place it in an ordinary coal oil barrel and pour on the beans one ounce of the bisulphide of carbon for every 100 pounds of grain, then close the barrel tightly, first with a wet canvas or cloth and, on the top of this, boards which should be left undisturbed for two days at least.

THE CARROT RUST-FLY (*Psila rosæ*, Fab.), mentioned in my last report, has been sent in as having appeared in injurious numbers at two new localities in the province of Quebec and also occurred in small numbers at Ottawa. This year white field carrots were attacked, as well as red ones. The semi-transparent yellowish maggot $\frac{1}{4}$ of an inch long perforates the roots in every direction, leaving dirty brown burrows. The maggots are blunt at the tail end, but taper towards the head, where is a black hooked tip forked at the base, by means of which the maggots burrow their way through the roots. The pupa-case is reddish-brown and, as a rule, is found in the earth outside the carrots. The mature fly is $\frac{1}{4}$ of an inch long, bright shining black with yellow legs and red eyes. There are at least two broods, if not more, in a season.

This is a serious pest of the carrot, rendering the roots quite unfit for table use. Its occurrence, however, has been intermittent, bad attacks one year being sometimes followed the next season by a total absence of injury.

"Knowlton, Brome Co., Que., July 6.—I send you to-day by mail a little box in which are a few carrots badly infested by a small white maggot. Nearly one-third of my patch of carrots are dead from the effects of it, and it is only a few days since they

began eating them. Can you give me any information as to what to do to get rid of them? What is it that lays the eggs? It is something new to me as I never noticed them before."—[J. Raymond Ball.]

"Quebec, Oct. 18.—I send you herewith a White Belgian carrot. My crop this year has been almost ruined by this disease, which you will be able to examine on the samples sent to you. Please tell me what is the matter and how to prevent it."

"Quebec, Oct. 27.—In reply to your inquiry as to whether my crop is the only one in this neighbourhood which has been injured by the Carrot Rust-fly, I beg to inform you that this year is the first that I have known the carrots to be injured by this fly. I secured a superb crop from the same field last year without any trace of the disease. My farm is situated at Ste. Marie, Beauce, and all the crops of carrots in the district have been attacked by the fly this season."—[A. B. Dupuis.]

Remedies.—Spraying the carrots along the rows with kerosene emulsion, 1 part to 10 of water, by means of a knapsack sprayer, or sprinkling along the rows dry sand, land plaster or ashes, with which coal oil has been mixed at the rate of half a pint to 3 gallons of the diluent, or crude carbolic acid at the rate of half a pint in 5 gallons, are the only applications which I know to have been used to any advantage. This should be done once a week through June from the time the roots begin to form and particularly after the rows have been thinned. Late sowing has also been found very useful.

Changing the location of the beds as far as possible from infested land has also been attended with excellent results and this common sense precaution should always be practised, when possible, in the case of all attacks of injurious insects. Where carrots are stored during the winter in sand or earth, this, of course, must be treated to destroy the pupæ which leave the roots and enter the soil to pass their last preparatory stage. Miss Ormerod suggests that this earth might be put into a wet manure pit so as to prevent the hatching out of the flies. Should neither of these methods be convenient, at any rate, the earth might be buried in a deep hole dug in the ground for the purpose.

THE TURNIP APHIS (*Aphis brassicæ*, L.)—One of the worst attacks upon root crops this year has been by the Turnip Aphis. In many parts of Ontario Swede turnips were badly injured. In Manitoba, likewise, an outbreak of this pest was brought to my notice by Mr. Bedford. The following extracts bring out the chief points upon which information was asked by correspondents:—

"Eddystone, Northumberland Co., Ont., Sept. 2.—On account of the very hot weather, lice are threatening to destroy the turnip crop in this part of the country. Is there any cure or preventive for it? Can spraying be successfully done?"—[W. G. Sargent.]

"Sherwood, York Co., Ont., Nov. 25.—In reply to your letter I would state that lice on turnips are not an entirely new pest, but they have never appeared in such numbers or with such destructiveness as this year. They have appeared in past years in small patches and were not considered very damaging. I think the reason that they were so numerous was the dry weather, as we had no rain from 1st July till the beginning of September, and it was exceedingly hot also. It wilted the mangel leaves in some localities. In the townships east and south of us, where they had more rain, the injury to the crop was not so great. In answer to your other question, I notice that the pest was destructive on all soils except perhaps some very low wet soils where sufficient moisture was obtained to keep up a steady growth."—[James H. Keffer.]

"Morden, Man., Sept. 28.—I send herewith a turnip leaf infested with some sort of insect. Last fall the same insect attacked the turnips, destroying the crop entirely. The root starts to decay as soon as the plant is attacked. All the turnips in this district went the same way. I should like to know what can be done to save the crop another year. I am taking up those turnips not already affected.

"Morden, Man., Dec. 28.—When you replied to my inquiry *re* turnip aphis, you asked me whether there had been much damage done in this neighbourhood. I have been inquiring of those who grow turnips, and find that nearly all the turnips in this district were damaged. In some cases the turnips were not attacked till late in the fall, and these were not damaged to any great extent."—[Alfred Bradshaw.]

The plant-louse which does most harm to the Swede turnips in Canada, is the same species which is also sometimes destructive to cabbage and is better known as the Cabbage Aphis. It does not usually appear on turnips until August, and is stated by many correspondents to be worst in dry years. There is a general impression that nothing can be done to prevent injury, and as a consequence these insects are, as a rule, left unmolested and a great loss sometimes occurs.

Remedies.—At the time these plant-lice first appear in fields, they are nearly always found in patches of restricted area. These should be looked for at the time the turnips are hoed and thinned, when good service may be done by simply hoeing out the infested plants and, having pulled some earth over them with the hoe, then pressing it down firmly with the foot. When the plant-lice are too numerous for this simple treatment, the plants should be promptly sprayed with a knapsack sprayer, using as an insecticide kerosene emulsion, 1 part to 9 of water, or whale-oil soap, 1 pound in 8 gallons of water.

ROOT MAGGOTS in turnips are seldom complained of in the West, where radishes are grown to the greatest perfection. Occasionally, however, there is a local outbreak of these troublesome insects. Mr. T. N. Willing, of Sylvan Glade, near Olds, Alta., sends specimens of the Cabbage Root-maggot (*Phorbia brassicæ*, Bouché), which, he says, "are from a larva about $\frac{3}{8}$ of an inch long, whitish with black hooks at end, which feeds in the Swede turnips. From one small turnip I found about 75 had entered the sand in which I had placed the turnip, and were in the pupa form. I inclose some with the flies. I had the turnip in the house about three weeks before these flies hatched out. Quite a large proportion of my turnips were damaged by this fly. I suppose it would be well to change the location of my turnip patch next season."

There were, as usual, inquiries from several other parts of Canada where the maggots of this fly are known to occur injuriously, one of the worst occurrences being along the shores of the lower St. Lawrence in the province of Quebec, where sad havoc was wrought in the gardens of the poor fishermen, who have to depend to a large measure on the products of their gardens. An account of this outbreak was sent to me by Dr. A. Mackenzie Forbes, of Montreal.

Remedies.—A sure remedy for these troublesome maggots is still much needed. Every year they are the cause of much loss in crops of great importance to a large number of people, such as cabbages of all kinds, turnips, radishes, onions, and sometimes beans and corn. A great many experiments have been tried with the object of discovering something of use. Many materials give partial immunity in ordinary seasons, but in bad years everything seems after a time to fail.

With onions and radishes, kerosene emulsion of the ordinary strength, 1 to 9, or carbolic soap-wash sprayed along the rows once a week gave tolerably good results, indeed some of the best results of many applications tried. The carbolic wash was made as follows: Dissolve 2 quarts soft soap in one gallon of boiling water, add 1 pint crude carbolic acid; when required for use, take 1 part with 50 of water. The most satisfactory application, but only to a small measure and early in the season, was White Hellebore or Pyrethrum powder dusted dry along rows of radishes at the time they appeared above ground and once a week afterwards. This is only applicable on a small scale. Experiments with kainit showed that this material assisted the plants very much in outgrowing injury, which in the case of cabbages is of very great importance. Kainit has also insecticidal value; but not, I think, to the degree which is claimed for it. It was tried (i.) broadcasted along the rows of onions and radishes, (ii.) sunk in a drill close to the rows and (iii.) in solution. When sunk in a drill it seemed to give better results than with the two other methods. In solution, when used strong enough to affect the maggots, it also injured the bulbs of the radishes, causing black spots, which afterwards rotted. Onions, however, were not injured, and the treated rows were decidedly better than the untreated. Experiments with cabbages showed that the best results were secured with a mixture of 4 ounces of kainit and 4 ounces of hellebore in $2\frac{1}{2}$ gallons of water, half a teacupful being poured round the base of each cabbage after pulling away the soil down to the true roots and applied in the third week of June, just as soon as the maggots were detected.

Through the kindness of Mr. M. V. Slingerland, of Cornell University, I was supplied with a number of the Goff tarred-paper cards. These are hexagonal pieces of ordinary tarred building paper, 3 inches in diameter, with a slit from one angle to the centre, where there is a star-shaped perforation to allow the placing of the card around the stem of a young cabbage. These were asked for rather too late in the season to give them a fair trial, but the plants upon which they were tried were well protected by them, and all those growers of cabbages who have used them speak highly in their favour.

POTATO INSECTS.

The potato crop in Ontario has been a good one. The seed was got in early and the plants suffered no checks from severe frosts. The Colorado Potato Beetle was less destructive than usual. Fine weather at the time of digging, except in some parts of the Maritime Provinces, allowed the crop to be got in in excellent order. There were very few complaints of insects or potato rot. In Manitoba and British Columbia the only adverse reports were from the drier sections, where in some instances the sets had failed to sprout. This was almost entirely where the tubers had been cut before planting. Moderate-sized whole potatoes had given by far the best results. In the Maritime Provinces potatoes were not so favourably reported upon as usual, owing to the wet autumn. Mr. B. W. Chipman, the Secretary for Agriculture of Nova Scotia, in his November *Crop Report*, says: "The potato crop this season, owing to the rains, which caused a great deal of rot, is only 68 per cent of an average, just the same as last year, but the prices have been fair." In Prince Edward Island where potatoes are a crop of very great importance, Father Burke estimates that there was only half a crop. He says: "The crop came up well and showed every sign of being large. The potato beetle came so late that many thought we were going to escape it. The wet early season was against its spread; later the beetles multiplied fast enough, but were controlled by Paris green, which everybody but those a thousand years behind the age now uses. The potato beetle did no injury to our crop this year." Several correspondents in Nova Scotia, Quebec and Ontario refer to the small losses from the Colorado Potato Beetle, but in Manitoba where this insect is very seldom a serious pest, it occured in injurious numbers in several places and required constant attention.

White Grubs and Wireworms have been reported as doing more harm to potatoes than for many years, and unfortunately nothing can be suggested as a remedy. In Nova Scotia where wireworms are sometimes very destructive in potato fields, it is a practice, when digging or ploughing up a crop in infested land, to pick up the potatoes immediately they are dug, when most of the wireworms will be taken with them from the field. After a short time, the wireworms will leave the potatoes and, if the crop is gathered in sacks or in carts, when the tubers are emptied out the wireworms will be found at the bottom and can be killed.

The Four-lined Leaf-bug (*Pœcilocapsus lineatus*, Fab.).—A somewhat unusual attack on potatoes, which early in the season appeared as if it might prove serious, was by the Four-lined Leaf-bug at Carrville, York County, Ont. Mr. J. Lahmer sent specimens and told of their ravages on some rows of potatoes which he had seen in a neighbour's garden. In acknowledging receipt the usual remedies for sucking insects were given and the life-history of this particular one was described. Later in the season, Mr. Lahmer wrote that the bugs did not spread further over the potato patch, but merely remained on the plants first attacked or on the bushes near by. The owner of the garden when he learnt that they were not a new pest lost interest in the matter and neglected to apply any remedy. The Four-lined Leaf-bug attacks many kinds of plants in gardens, having a special liking for sage and mint, currants, gooseberries and several other plants. The presence of the bugs is easily detected by the numerous brown spots about as big as a pin's head upon the leaves near the tips of the branches.

Fig. 16.—The Four-lined Leaf-bug.

The remedies consist of (I.) Spraying the nymphs or partially developed bugs which cannot fly, with a strong kerosene emulsion (1 to 6); (II.) The jarring or beating of the nymphs and perfect insects from the attacked plants into open tins containing coal oil and water; and (III.) The destruction of the eggs, which are always laid in the twigs of bushes, particularly the currant, near the tips; these are white, and, as they protrude slightly through the bark, when once seen they are easily recognized again, and thus this attack may be controlled to a large measure by winter pruning.

FRUITS.

The fruit crop of Canada has again been a good one. In Ontario, apples, as stated in the November *Crop Report*, were considered more than sufficient for home consumption; very large shipments were made to England and the United States from the western fruit-growing sections; pears, peaches, plums and smaller fruits were also shipped from many localities. From Nova Scotia, the other large fruit exporting province, Mr. R. W. Starr, of Wolfville, N. S., a successful fruit grower and shipper of many years' experience in the Annapolis Valley, writes: "The spring opened early; fruit trees showed a mass of bloom everywhere, but cold rainy weather set in, bees and other insects could not work and pollination was imperfect, especially among apples. Many orchards that showed much young fruit apparently well set, some ten days later, had the ground covered with young apples, leaving apparently very few on the trees. As the season passed on we had frequent showers, but the total rainfall was not more than usual. All the fruit that set healthily developed rapidly, and the extra size made up largely for lack of numbers; the export will, after all, be a good average quantity, say, 250,000 barrels, and the quality better than usual."

Mr. S. C. Parker, Secretary of the Nova Scotia Fruit Growers' Association, says: "The damage to crops this season by insects has, perhaps, been the least of any season in my experience. All insects noted in the orchard and garden were fewer in numbers than for some years past. The means of combating these different pests and the best remedies have been made so widely known that farmers are on the alert to clear them out when they show themselves. Cutworms were conspicuous by their absence. Curculio did not appear to be as destructive as usual, at any rate, did not materially lessen the enormous plum crop. There were no complaints of Codling Moth or Shot-hole Borer, and the Bud-Moth was not as common as usual. Apples were good, more than usually free from Black Spot; the prices were away up and there was a fair crop. There were two bad enemies, however, of plum trees: the Shot-hole Fungus (*Septoria cerasina*, Peck) has devastated many plum orchards, and I expect to see a lot of dead trees next spring; the Black Knot (*Plowrightia morbosa*, Sacc.) has been very bad. Many have about given over fighting it. With plums a drug on the market, the game is not worth the candle."

With reference to the prevalence of fungous diseases, Mr. R. W. Starr also writes: "In most plum orchards rot set in badly, and as a rule, there was more fruit left in the orchards than was picked for the market. Some kinds were worse than others, especially Lombards; whole orchards also were ruined by Leaf Blight and were bare of foliage when the fruit was two-thirds grown. The Japanese varieties seemed to stand a wet season better than the descendants of *Prunus domestica*, L. Burbank did especially well. Abundance seemed to be rather susceptible to Shot-hole Fungus. Most of our early peaches rotted on the trees. Red Rust Fungus on the quince formed lumps somewhat resembling Black Knot in shape. Currants and gooseberries were stripped of their leaves by a blight, and pears showed more Fire Blight than for many years. You will gather from the above that fungous diseases have been very prevalent. I think we must ascribe this to the dull showery weather. I have wondered how the apples escaped as well as they did. Former experience would have led me to forecast a very different result."

It is satisfactory to hear from Prof. F. C. Sears, the Director of the Nova Scotia School of Horticulture, at Wolfville, N.S., that "Spraying was much more generally practised this year than ever before, and the results were very satisfactory, especially so in the use of Bordeaux mixture to control the Black Spot of the apple and the Shot-hole Fungus of the plum. I held about fifteen spraying meetings in different parts of the province and induced fruit growers to experiment also for themselves. I sprayed some rows and left others. The results have been very conclusive in most cases."

In Prince Edward Island, Father Burke says: "Despite our spraying, we had our share of apple-worm, some sorts of apples being badly injured; the season being so wet, the Bordeaux mixture did not stay on long enough to do its work. Owing to the wet season, there was also a lot of Black Spot, but, on the whole, we have a fair apple crop."

In British Columbia, fruits of all kinds were abundant, but there was much loss from insect pests. The two worst enemies of the apple growers were the Apple-fruit Miner *(Argyresthia conjugella, Z.)*, and the small moth described by Walsh in *First Illinois Report* under the, as it has since been ascertained, rather inapt name of the Plum Moth *(Grapholitha prunivora*, Walsh*)*.

The fruit interests of the Pacific province are well looked after by the energetic officers of the provincial Department of Agriculture. The Deputy Minister, Mr. J. R. Anderson, and his Assistant, Mr. E. A. Carew-Gibson, have done excellent scientific work in investigating the botany and entomology of the province, particularly in solving some doubtful points in the life-histories of important enemies of crops. Mr. R M. Palmer, the Inspector of Fruit Pests, has devoted special attention to the practical questions of orchard treatment, of making known the best remedies for pests and the way to apply them, of keeping the provincial markets clear of infested fruit, and thus incidentally creating a better market for home products. British Columbia is blessed to a remarkable degree with a climate and soil suitable for the production of fruits of many kinds, and the wise and energetic measures which have been adopted and fearlessly carried out by the officials of the provincial government have certainly been attended with much success. Up to the present time, notwithstanding statements to the contrary, the Codling Moth has not been detected in any British Columbian orchard.

THE APPLE FRUIT-MINER *(Argyresthia conjugella, Z.)*, which has called for so much attention of late years by its injuries to apples in British Columbia, was again this year the cause of considerable loss. In mixed orchards containing several varieties of apple trees, I noticed last summer that crab-apples were more particularly attacked than the larger kinds. Mr. Palmer makes the following report on the occurrence of this insect in British Columbia during 1898:—

"Victoria, B.C., Dec. 15.—On the Islands, especially in the neighbourhood of Victoria, the Apple Fruit-miner *(Argyresthia conjugella)* has been very prevalent this year. The native crab-apple crop was a failure, and this pest attacked cultivated fruits (apples) to an alarming extent. It preferred cultivated varieties of crab-apples to ordinary varieties of apples, and a much larger percentage of larvæ completed their growth in infested crab-apples than in the finer fruit. The entire crop of many crab-apple trees (cultivated varieties) was completely ruined, being tunnelled in every direction, all through the pulp of the fruit. Every effort has been made to get infested fruit destroyed, as, although in 1896 some loss was sustained from the pest, it was not nearly so large as in this season, and I now apprehend there is some danger of the insect becoming a constant feeder on cultivated varieties at least of crab-apples, and possibly of some others.—[R. M. Palmer.]

An interesting account of a Japanese insect, *Laverna herelella*, Dup., which, if different, resembles in most respects the Apple Fruit-miner in a very remarkable manner, is given with an excellent figure in *Bulletin 10*, *New Series*, Div. of Ent., U.S. Dept. Agr., by Prof. Matsumura, of Sapporo, Japan. In a foot-note to this article, Dr. Howard has suggested, from the resemblance of Prof. Matsumura's figure to bred specimens of the Apple Fruit-miner from British Columbia, which he was good enough to examine, the identity of the two insects. Although it is true the figure cited and the perfect moths

of the Apple Fruit-miner do agree closely, the habits of the larvæ as given by Prof. Matsumura (*loc. cit*) and as described in my annual report for 1896, differ upon what seem to be such important characters that for the present I can hardly think that the two attacks are by the same species. The writer of the article referred to says that the larvæ live only in apple cores, injuring the seeds, that there is usually only one egg deposited on each apple, and that the cocoons are made in the earth whenever possible.

The British Columbian insect very rarely attacks the cores and seeds of the fruit. There are usually several, two, three or more, larvæ in each apple, and the cocoons are made beneath flakes of the bark on the trees or beneath leaves or rubbish on the surface of the ground.

I have lately received the following interesting note from Prof. Enzio Reuter, of Helsingfors, Finland, on the occurrence of *A. conjugella* in Europe :—"I have read your report with great interest. *Argyresthia conjugella* has during the past summer infested the fruit of apple trees throughout the whole of Finland. This is owing to a total failure of sorb-apples (*Sorbus Aucuparia*, L.)* and bird-cherries (*Prunus Padus*, DC.), in which the larvæ commonly feed."

All efforts to discover the egg or the egg-laying habits of the moth have so far failed, and no proved, practical remedy is yet available. At Mr. Palmer's suggestion, many of the fruit growers in the districts where this insect has been troublesome, have adopted the wise precaution of picking and destroying every apple which showed the attacks of the larvæ.

Prof. Matsumura suggests the catching of the moths of the Japanese insect by suspending large-mouthed bottles containing sweet solutions beneath the trees at night; he points out that these should be closed during the day time so that many useful or harmless insects may not be destroyed.

THE PLUM MOTH or LESSER APPLE-WORM (*Grapholitha* [*Semasia*] *prunivora*, Walsh).—For many years British Columbian apple growers have referred to a small caterpillar which in every thing but size answered to the caterpillar of the Codling Moth. The insect was not abundant and all efforts to obtain specimens to rear the moth failed. Last year a few were secured by Mr. E. A. Carew-Gibson and successfully reared to maturity. The perfect insect, a small moth, was kindly identified by Dr. L. O. Howard, the United States Entomologist, and proved to be the same insect as was treated of and figured by Benjamin Walsh in his *First Report* as State Entomologist of Illinois, under the name of the Plum Moth (*Semasia prunivora*). Walsh bred specimens of the moth from plums, from the fungous growth known as the Black Knot of the plum, from the Cock's-comb-like hollow gall (*ulmicola*, Fitch) on the leaves of elms, which is produced and inhabited by plant-lice, and lastly from a hollow gall on the leaf of red oak. In addition to the above, the late Dr. C. V. Riley (*Am. Ent.* (*III*), n. s., I, 131) adds that he has bred the moth from galls on oak, from haws, from crab-apples and abundantly from cultivated apples. I have at different times bred the moth from apples and haws at Ottawa, from near Toronto and from Lachine, Que. I can find no reference in recent publications to serious injury to either apples or plums by this moth. Single specimens of the caterpillar have been sent in occasionally from Quebec and Ontario, but, as far as I am aware, they have never been sufficiently abundant to be more than noticed by the curious. Last year, however, Mr. R. M. Palmer expressed fears, from the numbers he was finding in British Columbian apples, that the insect might develop into a pest of importance. At that time he complained only of the commonest form of attack by the caterpillar, which is to feed beneath a web upon the skin of the apple, around and inside the cup at the calyx end, or occasionally to burrow more or less extensively under the skin. When visiting British Columbia last summer, in the last week of July, I was shown by Mr. Carew-Gibson a large number of apples which had been handed over to him by Mr. Palmer, which were very seriously infested, both by this insect and also by the Apple Fruit-miner. Upon cutting open several of the infested apples, I was surprised to find how exactly in many instances the work of

* In this country called "Mountain Ash" or "Rowan tree."

the larvæ of *G. prunivora* resembled that of the Codling Moth (*Carpocapsa pomonella*, L.). Not only was the skin and flesh just around the calyx eaten, but the apple was bored into extensively, the core being frequently reached and the pips eaten in precisely the same way as is done by the Codling Moth caterpillar. Every specimen was examined carefully and proved to be *G. prunivora*. This same fruit was also found, as stated above, to be badly infested by the Apple Fruit-miner, as well as the Lesser Apple-worm, both kinds occurring in the same apple.

"Victoria, May 8.—The specimen that I am sending is the only adult that I have managed to rear; you will note in size it is not more than half the size of the Codling Moth; it has also different markings and its larva never reaches more than half the size of the Codling Moth larva when full-grown. This is the insect whose larva is so often mistaken in this province for the larva of Codling Moth and reported as such. It is fairly common in some spots, but owing to its size cannot do so much damage to the fruit it attacks."—[E. A. Carew-Gibson.]

"Victoria, Dec. 15.—The larva of *Grapholitha prunivora* has been found this season widely distributed all through the lower mainland and the Islands as well. Although usually attacking apples, feeding at the calyx end of the fruit for about ½ an inch down, it is also often found inside the fruit, and has been been frequently mistaken for the larva of the Codling Moth (*Carpocapsa pomonella*). It has also occurred quite often in plums and prunes, and specimens of fruit so infested have been sent in or collected from the whole of the districts named.

"This pest and the Apple Fruit-miner evidently need more attention at the hands of our fruit growers in the future than has heretofore been accorded them. In the case of the Lesser Apple-worm, I think that spraying with Paris green as for the Codling Moth may be of considerable value. I shall be glad of any suggestion you can make as to dealing with these pests.

"A large number of the larvæ collected this season have been carefully attended to by Mr. E. A. C. Gibson, and it is hoped that a number of specimens of the perfect insects and perhaps some parasites will hatch out in the spring. Many specimens of fruit collected contained larvæ of both species."—[R. M. Palmer.]

From the past history of this insect, particularly in British Columbia, and after talking the matter over with Mr. Palmer and Mr. J. R. Anderson, who three years ago found numbers of apples badly infested in Capt. Gaudin's garden, at Victoria—from which, however, the insect has since entirely disappeared—I think it hardly likely that this caterpillar will develop into a serious pest of apples or plums. It is probable that the injuries of this year, which are certainly exceptional, were due to the failure of the wild crabs to produce fruit this year in British Columbia, and that both this insect and the Apple Fruit-miner were driven to cultivated fruits, as it is related in Dr. Reuter's interesting letter was the case with *Argyresthia conjugella* in Finland this year.

Should injury by the Lesser Apple-worm continue, I have no doubt, as suggested by Mr. Palmer, that spraying with Paris green should be the first remedial experiment tried.

Notes on the Lesser Apple-worm, by Mr. E. A. Carew-Gibson.

Aug. 16, 1897.—Received from Hornby Island, a number of apples infested with a small boring worm.

Sept. 17.—Found six larvæ from above apples spun up, five in the paper beneath the apples, using the paper fibre for their cocoon, and one spun up on the cork of a small specimen bottle using cork dust for its cocoon; all the spun up larvæ at this date unchanged. The specimens are $\frac{3}{8}$ inch long, $\frac{1}{16}$ inch in diameter, tapering slightly towards both extremities; reddish pink to pale pink in colour, lightest in colour between the segments. Head smaller than 1st segment, with blotchy darkish brown markings, thoracic and anal plates also darkish, marked with brown. Body covered with white bristles, with finely dotted surface to the skin (under the microscope). Surface with lumps and depressions. Very active when placed in the sunshine, evidently at once seeking shelter for spinning up. The larva spun up on the cork very closely covered over with cork dust.

May 7, 1898.—One very active little moth emerged.

E. A. Carew-Gibson.

The moth expands about $\frac{5}{8}$ of an inch across the wings. The ground colour of the front wings is black, with large patches of rusty red and a central steel blue blotch. Along the costa are seven very conspicuous short white streaks, arranged 2, 2 and 3 together, of which the longest are the 1st, 3rd, 5th and 7th; these streaks are nearly parallel to each other and are obliquely directed toward the posterior angle of the wing. The hind wings are dusky gray at the base, shading into black at the tip.

The other insects which have attacked fruit trees during the past summer are well known species. Of these none have called for more attention by their excessive numbers than the TENT CATERPILLARS, which swarmed on forest and orchard trees in many sections of almost every province of the Dominion.

Enormous numbers of Tent Caterpillars of the two common species, the Forest Tent Caterpillar (*Clisiocampa disstria*, Hbn.), and the American Tent Caterpillar (*C. Americana*, Harr.), occurred in the woods and on trees in gardens and orchards for many miles around Ottawa and through the counties of Carleton, Russell and Grenville; nor were they confined to this part of the province, for specimens or letters of inquiry came in from every direction. Aspen poplars, maples and basswood seemed to be the favourite food plants, but where the caterpillars were abundant the foliage of all plants was eaten.

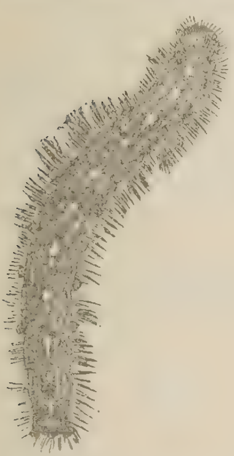


Fig. 17.—American Tent Caterpillar.

"Victoria, B.C., Dec. 15.—On the Lower Mainland the most troublesome pests of the season were the Forest-tree Tent Caterpillars. They were present in countless thousands and fruit trees in proximity to native trees such as alders and willows, where the pests hatched undisturbed, were in danger of being defoliated, even when considerable attention was devoted to fighting the pests. Fruit trees from which the leaves were eaten, put on foliage again later in the summer, but went into winter in poor condition to withstand vicissitudes of weather. Fortunately, by far the larger proportion of the larvæ were parasitized and egg masses of the pests are not nearly so numerous as last year; besides this, fruit growers were roused as a rule to the danger from these voracious insects and better prepared to fight them both by the destruction of eggs during the winter months and by means of Paris green spraying later on."—[R. M. Palmer.]

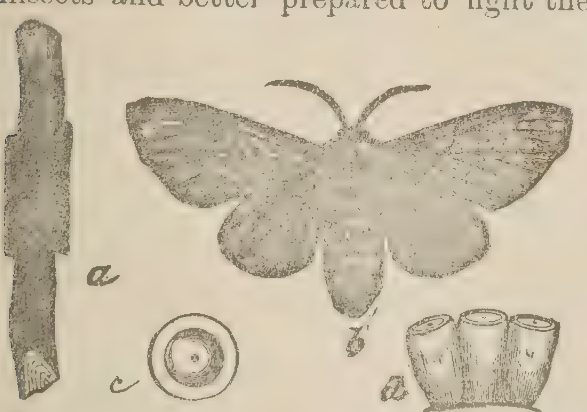


Fig. 18.—The Forest Tent Caterpillar: *a*, egg cluster on twig; *b*, moth—natural size; *c*, *d*, eggs—enlarged.

When I was in British Columbia last August, Mr. T. A. Sharpe, of Agassiz, drew my attention to the fact that a very large percentage of these caterpillars had been destroyed by a very fatal disease after they had spun their cocoons. He examined one hundred cocoons before he found one containing a living pupa. Unfortunately no such state of affairs happened in the Ottawa outbreak, for at the present time the egg clusters (Figs. 18*a* and 19) are to be found abundantly on trees and shrubs in every direction. On one small cherry tree 10 feet high, I collected no less than 37 egg clusters. The eggs in every one of them appeared to be in a healthy condition, and the young caterpillars hatched out in thousands in my office. There is the greatest necessity for all who wish to save their trees to take steps next season, in the first place, to clear from the trees during the winter such eggs as can be reached, and to provide themselves with spraying apparatus so as to be ready to destroy the caterpillars

Fig. 19.—Egg cluster of the American Tent Caterpillar.

next spring while they are still small, using the ordinary standard mixture for foliage-eating insects, namely, 1 pound of Paris green, 1 pound of quick lime, and 200 gallons of water.

THE PLUM CURCULIO (*Conotrachelus nenuphar*, Hbst.).—Plum growers have pretty generally adopted spraying with Bordeaux mixture and Paris green as the best remedy against the Plum Curculio upon plums. The treatment, however, is by no means claimed to be a perfect remedy, although I believe that the saving in the quality of the crop will always make it pay handsomely to spray plum trees, and in the mean time it is the *best* remedy. The fact that most of the large plum growers have adopted spraying as a regular practice speaks for itself and shows that it pays them to do so. Spraying cherries and peaches has not been quite so satisfactory as in the case of the plum, and upon the apple to which the Plum Curculio is sometimes very destructive it would appear that spraying is even less effective. Nevertheless, it pays to spray as in the other cases.

In October last, I received through Mr. W. T. Macoun, some specimens of apples which had been utterly ruined for the market by the Plum Curculio, being gnarled and indented wherever the beetles had bitten ("stung") them. At the same time the growers of the apples, Messrs. R. Jack & Sons, of Chateauguay Basin, Que., sent a bottle filled with specimens of Plum Curculio taken on the apple trees from which the injured fruit was sent. Messrs. Jack & Sons write :—

"Chateauguay Basin, Que., Nov. 8.—You ask if plums are badly affected by Curculio with us. They are, very badly, both on the farm and all round this section of country. I have known the pest sometimes to destroy the whole of the crop on some of the trees. You ask also whether the female uses the young apples to deposit her eggs in. That is the way in which most damage is done. Sometimes we have not been able to find a sound apple on some trees with about a bushel of apples on. Most of the apples had eggs deposited in them or had been punctured, and some of the apples would have as many as three or four eggs in them. We have noticed some apples injured within two or three days after the blossoms have fallen. We notice very little difference between sprayed and unsprayed trees. They seem to be very little affected by Paris green. Last season we used Paris green in the first two applications of Bordeaux mixture, *i.e.*, once before blossoming, and immediately after the blossoms had fallen, at the rate of 8 ounces to 50 gallons of water, and still they injured great quantities of apples. The kinds which they seem to have a preference for are Duchess, Yellow Transparent, Astrachan, Grimes Golden, and Golden Ball, but if these kinds are scarce they work on the other varieties. In fact, the Curculio does us more damage than all the other pests and fungous diseases combined. A good many apples fall prematurely with the larva in them. Do you think it would be any advantage to pasture the orchard with sheep, so that they would eat the fallen apples and so destroy the grub? We send you under separate cover samples of apples which have been injured by them."

"November 18.—Your favour of the 12th instant to hand. In it you ask how long it is since we noticed the Curculio destroying the apples. We would say that it is about six or eight years since we have noticed them doing any injury to any extent to apples, but they have troubled the plums for a good deal longer period. They also do considerable damage to cherries. We have along one of the line fences between our neighbour and ourselves, a row of common red plums which have been infested with Curculio as long as we can remember, but the place where the Curculio is worst is at the other side of the orchard. We intend to have these old plum trees cut down this fall and have the land cultivated for a couple of years. There is in a field next to the orchard a clump of hawthorns of which the haws have been infested with little grubs, but we have never experimented to see if they were Curculio or not. Perhaps you could give some information ? I notice that the Curculio does not seem to do so much damage where the trees are cultivated often."—[R. Jack & Sons.]

The above letters were in reply to questions which are well indicated by the answers given. Some of the apples forwarded by Messrs. Jack had from 5 to 25 punctures and were utterly useless for the market. It is well known that the Plum Curculio lays

its eggs in apples and that the larvæ can develop in this fruit, but most of the injuries in this case were of the nature of a hollow cavity beneath the skin, the flesh appearing to have been eaten out through a central orifice. Frequently these cavities were at the bottom of deep depressions, and there were no galleries in the flesh of the apple. That the injury to apples extended further than the immediate vicinity of Chateauguay Basin was shown by my receiving specimens injured in exactly the same way from Professor L. R. Jones, of Burlington, Vt., with the information that the injury was quite common on Baldwins and Greenings and that considerable injury had been caused in the State of Vermont. The advantage of attending to windfalls, either by collecting them or pasturing sheep or pigs in the orchard was pointed out, and the opinion was expressed that the grubs which had been found in the haws were more likely to be those of the true Apple Curculio (*Anthonomus quadrigibbus*, Say.) than of the Plum Curculio. The fruit of the hawthorn is nearly always infested by *Anthonomus quadrigibbus*, and, as far as my own experience goes, it is a very rare enemy of the apple. As a remedy for this attack on apples by the Plum Curculio, nothing further can be suggested than spraying the trees regularly with Paris green, beginning early and continuing as late as possible through the season. Where it is practicable, jarring the trees over large sheets placed on the ground and then destroying the beetles will, of course, reduce very much the amount of injury.

THE GREEN FRUIT-WORMS (*Xylina*).—The larvæ of two or three species of this genus were unusually abundant and destructive in some parts of Ontario last summer. Mr. W. M. Orr found them in many orchards when superintending the Provincial Government spraying experiments. He estimates the loss from these caterpillars at between 20 and 30 per cent. Mr. N. H. Cowdry, of Waterford, Norfolk County, Ont., sent specimens of the caterpillars, together with their work on young apples and pears. He said: "They seem to feed exclusively on the young fruit to which they are exceedingly destructive, but they do not touch the foliage. They are very numerous about here, and, owing to their habit of eating the fruit only, are hard to destroy by spraying." An account of injury by Green Fruit-worms, was also received from Mr. John A. Link, of Sombra, Lambton Co., Ont.

Fig. 20.—A Green Fruit-worm: *a*, caterpillar; *b*, moth.

At Aylmer, Wright Co., Quebec, large silver maple trees (*Acer dasycarpum*) and to a smaller degree other trees and shrubs growing near were almost defoliated by the larvæ of a species of *Xylina*, which were in such numbers that every tree trunk and fence was swarming with them in the third week in June, as they moved from tree to tree in search of food. Almost all the specimens collected died from injuries inflicted upon each other in the breeding jars. A single specimen of the moth was reared which seems to be *Xylina Grotei*, Riley. The caudal end of the pupa resembles that of *X. laticinerea*, Grote, as figured by Mr. Slingerland on Plate II. of his Cornell University *Bulletin 123*, except that the cremastral spines are less pronounced.

Another outbreak, not quite so severe as the one above mentioned, occurred at Niagara on the Lake, where large maples planted as shade trees were covered with these caterpillars to the great inconvenience of passers by in the streets. In this case, I think it hardly possible that many of these larvæ could have reached the perfect stage, for the trees were visited incessantly by warblers and other insectivorous birds who vied with a swarm of English sparrows in the branches above and numerous chickens on the ground below, in destroying every caterpillar that moved. It is several years since these insects have been abundant enough to call for special treatment, but similar outbreaks to those mentioned upon forest and shade trees occurred in the vicinity

of Ottawa in 1885. The caterpillars of three distinct species of moths are known by the name of the Green Fruit-worms. These resemble each other very much in appearance and habits. They are discussed in detail by Mr. M. V. Slingerland, in his characteristically careful and accurate manner, with beautiful figures, in Cornell University *Bulletin 123*. The caterpillars may be described generally as cylindrical in shape with heads almost as wide as the body. Colour, pale leaf-green, striped longitudinally and dotted with creamy white. The full-grown caterpillar measures from $1\frac{1}{4}$ inches to $1\frac{1}{2}$ inches in length by $\frac{1}{4}$ of an inch in diameter. The food consists of the leaves of the apple, pear and several kinds of forest trees; the maple, poplar, hickory, wild cherry, box elder and the buds of roses are recorded among their food plants. Their greatest injuries, however, are to the fruit of apples and pears.

The moths vary considerably in appearance, but are characterized by the cold ash-gray colour of the front wings, which are variegated with darker gray. The most constant characters seem to be: a pale space at the base of the front wings and on the upper half, the pale upper part of the orbicular spot and the dark sub-terminal line. The expanse of the wings is from $1\frac{1}{2}$ inches to $1\frac{3}{4}$ inches.

"The moths are night fliers, remaining concealed on the bark of the trees or in secluded places during the day. Most of them appear during September and October, and, hibernating in sheltered places, appear again in March, April and May; some evidently remain in the ground as pupæ over winter, the moths not appearing until spring. They are readily attracted to lights or sweetened baits at night, and are 'often found in maple groves while sugaring is going on. Sometimes sap-pails are found in the morning with the surface of the liquid completely covered with the moths.'" (M. V. Slingerland, *Bulletin 123.*)

THE SAN JOSÉ SCALE (*Aspidiotus perniciosus*, Comstk.).—Since the passing of the San José Scale Act, on the 13th of March, 1898, every effort has been made, both by the Federal Government and the Provincial Government of Ontario, to detect any occurrence of this extremely injurious insect and to eradicate it with as little delay as possible. A thorough examination has been made of that section of the province of Ontario in which it was known that colonies of this scale insect had been found in 1897. Wherever infested trees were detected, they were dug up and destroyed. Trees known to have been imported from States or nurseries in which the scale had occurred during the last few years were followed up and examined in the orchards where they had been planted. It is satisfactory to know at the conclusion of this inspection that the prevalence of this insect in Canadian orchards is far less than it was feared last spring might be the case. The only locality where a new occurrence of special interest, from its northern latitude, has to be recorded is at Guelph, Ont., where the winters are sometimes very severe, the thermometer occasionally falling as low as 15 degrees below zero, Fahr. The scales in this case were imported on pear and plum trees and had passed through at least two Canadian winters; although the scales had survived, they had not spread to other trees. The passing of the San José Scale Act has naturally given rise to a great deal of correspondence as to what kinds of plants come within the provisions of this Act and are prohibited from being imported into Canada from any country where the San José Scale is known to exist. In framing this Act, great care was taken by the Hon. Minister of Agriculture to interfere as little as possible with established lines of trade and only to prohibit such plants as it was thought were a source of danger to this country. It is known that the San José Scale is liable to occur in a living state, and that thus it might possibly be introduced, upon any woody-stemmed tree or shrub, except conifers, the stems of which do not naturally die down to the ground every year. Such plants, therefore, may not be imported into Canada from any country where the San José Scale has been found. A very few exceptions have been made to this rule in the case of some plants which are only grown in greenhouses. These exceptions were authorized by Order in Council at the time of the passing of the Act and made public through the *Canada Gazette*. They have also been published in the reports of the Entomological Society of Ontario, of the Fruit Growers' Association of Ontario, and of other societies. No further exceptions to the Act have been made, and in the case of such plants as

raspberries and some other small woody-stemmed shrubs it was considered wise by the Hon. Minister, for the present at any rate, not to allow these to be imported, even when cut right down to the roots, for fear that this cutting might not be done thoroughly enough. True herbaceous perennials, like the perennial phlox, dahlias, herbaceous pæonies, and perennial asters, the stems of which die back right down to the roots every autumn, can be safely imported and consequently are not prohibited. The scale has been known to spread occasionally on to several plants with herbaceous stems, but as it can never move again after once settling down on any plant, which it does within two days after birth, and as during its active life it must constantly be supplied with liquid food, even, were it introduced in the dormant condition in which it passes the winter on the stems of herbaceous perennials which had died down naturally, such scales could never revive nor propagate ; in the first place, they would have no food in the dead, sapless stems, nor could they move to search for it elsewhere, owing to the scales which they have formed over their bodies since they settled down, and also to the important fact that very soon after settling they undergo their first moult, from which time they are absolutely without legs or other means of locomotion. In the second place, they could not propagate because they pass the winter in a half grown condition, and being deprived of food it is impossible for them to reach maturity.

The question is frequently asked at farmers' meetings when specimens of the San José Scale are shown on pieces of twigs and branches, whether there is not danger of introducing the scale into new localities by this means. For the reasons given above, there is manifestly no danger to be feared in this direction. The only way in which the scale can be spread is by the migration of the young insects during the short time that they are able to crawl about. The sap in any piece of infested wood which could be conveniently taken to a meeting for exhibition dries up in a few hours and very few of the young scale-insects could be born before the females died, even if the wood were taken at the time when the females were bearing young, and then these young insects would have to find their way on to living trees before many hours or they would die. It has been objected that upon wood bearing the Oyster-shell Bark-louse myriads of the young have been found moving several weeks after the scale-bearing branch had been severed from the tree. It must be remembered, however, that the habits of the Oyster-shell Bark-louse and those of the San José Scale are entirely different. When mature, the female of the former, before dying, lays beneath her scale a large number of eggs, which remain unhatched for many months from autumn until the following summer, during which time, of course, being eggs, they require no food ; so it does not matter how dry the branch bearing them beneath their mothers' scales may be ; but whenever these eggs are brought under favourable conditions they will hatch and the young bark-lice appear. With the San José Scale, on the contrary, eggs are never laid, but the females bring forth their young alive and at that time must be constantly supplied with liquid food. As stated above, if the scale-bearing wood is removed from the trees during the period of dormancy in which the San José Scale passes the winter, all the scale-insects upon such wood are immature and must soon die. This period of dormancy lasts in Canada, at any rate, from the beginning of November till the beginning of June. Close study of this insect has shown that none but the immature insects live through the winter, and, further, that these do not begin to produce young until after a considerable time of active life and growth the following season.

The keen interest which has been aroused with regard to all insect pests by the advent of the San José Scale has also drawn attention to various other kinds of scale-insects which have been found upon Canadian fruit trees. Many kinds of these have been sent in for examination. The Forbes Scale, the Putnam Scale, the New York Plum Scale and the Scurfy Bark-louse were all found in some numbers upon orchard trees. Although widely spread through the province of Ontario, not one of them was sufficiently abundant in any locality to be considered a serious menace to fruit growers.

In addition to the above, the Oyster-shell Bark-louse is extremely abundant all through Canada and is very destructive.

The standard remedies for scale-insects are kerosene emulsion or whale-oil soap solution (1 lb. in 2 to 4 gallons of water), applied early in the spring, just before the buds open.

APHIDES OR PLANT-LICE have again this year been conspicuous in orchards. In the Niagara district the CHERRY APHIS (*Myzus cerasi*, Fab.), appeared in enormus numbers early in the season and, although it disappeared as mysteriously as it had come, in some places, in orchards of cherries, particularly the sweet varieties, it did a great deal of harm. Mr. C. F. Purdy, of St. Catharines, this year lost heavily from this insect, which in his orchard was far worse than last year. Mr. Martin Burrell, of the same place, writes: "I find in my notes that the Black Cherry Aphis was very abundant on 27th May. Under date of 2nd June, I find: 'Black Aphis breeding rapidly, very few *Syrphus* larvæ or lady-birds'. I have no other notes, but, on the whole, the later injuries were not as bad as in 1897. We used whale-oil soap (1 lb. to 7 gallons) with fairly good results." Mr. R. M. Palmer, of Victoria, B. C., says: "The Black Cherry Aphis was commoner than usual all through the lower portions of the province. It is, too, much more difficult to kill by means of sprays and is not so much attacked by parasites as other species. The quassia spray No 2, I found quite effective if used hot, as hot as the hand would bear; if used cold, only partially so." The spray referred to is given in the useful pamphlet "Insect Pests and Plant Diseases" issued by Mr. Palmer for the provincial Board of Horticulture and is as follows:—

Quassia chips	8 lbs.
Whale-oil soap	7 lbs.
Water	100 gallons.

"Boil the quassia chips in about 8 gallons of water for 1 hour; dissolve the soap in hot water; strain and mix both solutions together and dilute with sufficient water to make 100 gallons altogether. To be used with a spraying pump, with as much force as possible in applying. This mixture is the standard remedy for Hop Aphis, and has given most satisfactory results against other Aphides with no injury to the foliage of the trees treated."

THE APPLE APHIS (*Aphis mali*, Fab.), like the last named, was unusually prevalent at the time the apple trees were budding and caused much anxiety in Ontario, Quebec and Nova Scotia. The remedies which were recommended were whale-oil soap (1 lb. in 8 gallons of water) and kerosene emulsion (1 to 9); but fruit growers on a large scale were advised to wait until, at any rate, the middle of May, to see if the natural parasites did not reduce the plant-lice sufficiently to make remedies unnecessary. This recommendation I believe from experience to be safe for Ontario, but in British Columbia the Apple Aphis requires treatment as early as it shows itself, for in that province it is a far more injurious pest than in any other part of Canada. Dr. D. Young, of Adolphustown, Ont., during the course of some correspondence about an outbreak of Apple Aphis on his apple trees, writes:—

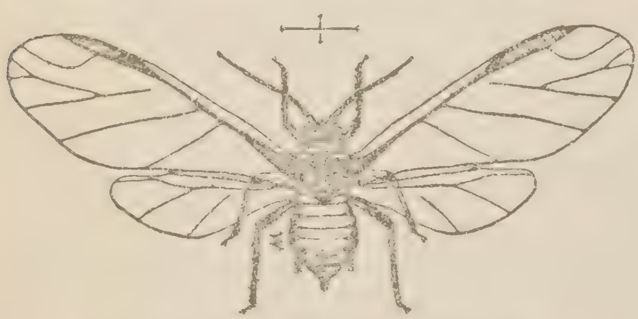


Fig. 21.—The Apple Aphis—enlarged.

"Adolphustown, April 20.—It would take about 270 sixty-gallon barrels of solution to spray my orchard, at 2 gallons per tree, so that I should need 1,065 gallons of kerosene and 266 lbs. of soap, besides the expense of labour. The tobacco spray would cost probably as much. I shall be glad to know whether you think it would pay me to spend a couple of hundred dollars in spraying for this pest or not."

In reply, Dr. Young was advised to wait a week or ten days, and if the plant lice did not increase perceptibly to do nothing beyond his regular spraying for Codling Moth and fungous diseases. Later in the season, I learned that this outbreak had passed away without doing serious harm to the crop.

The Bronze Apple-tree Weevil (*Magdalis ænescens*, Lec.).—Some specimens of apple boughs containing the young larvæ of this insect were received from Victoria, B.C., and Nanaimo, B.C. Mr. Palmer says of this insect :—" These small bark-borers, larvæ of *Magdalis ænescens*, continue to do much harm, especially in young orchards on dry lands of the Island. The lime, soap and carbolic acid wash is effective against them, if renewed at the end of May, but one application made early in spring has not proved sufficient. Many young trees were killed outright or so badly damaged that they will scarcely recover, where preventive measures were neglected."

From what I have seem of the injuries of this weevil, I am of the opinion that while the eggs are generally laid in trees which are in a feeble condition, at the same time they are also found in young and healthy apple trees. The attack by the beetles feeding upon the leaves of cherries noticed by Rev. G. W. Taylor on Gabriola Island last year was again noticed this season to a lesser extent, but appears to be a regular habit of the beetle. This might be taken advantage of for poisoning the mature insects as a means of reducing their numbers.

THE BLACK GOOSEBERRY-BORER

(*Xylocrius Agassizii*, Lec.).

Fig. 22.—The Black Gooseberry-borer : *a*, beetle ; *c*, *d*, larva ; *e*, pupa—enlarged.

One of the most interesting attacks which has come under my notice during the past season is by the extremely rare boring beetle (*Xylocrius Agassizii*), which may be called from the colour of the mature beetle and its habits, the Black Gooseberry-borer. The introduction of this insect into British Columbia, its detection and almost certain extermination by the Inspector of Fruit Pests, and also the successful rearing of the mature insect by Mr. E. A. Carew-Gibson are detailed in the following letters. It is hardly probable that this insect will ever become a serious pest of gooseberries, for it has been so extremely rare in the past that few collections possess specimens, while at the same time its probable native food plants, the various species of *Ribes*, are abundant on the Pacific slope.

" Victoria, B.C., March 1.—I am sending you by present opportunity under separate cover a box containing a bottle with borer grub and remains of roots of some young gooseberry bushes, which you will note have been hollowed out. Can you name this borer for me? I have not seen it nor heard of it before."—E. A. Carew-Gibson.

" Victoria, B.C., March 3.—I am sending you by same mail some specimens of roots of gooseberry bushes infested with a root borer, also a specimen borer in fluid. These plants came from Oregon last fall in a large consignment of plants, part of which —the younger bushes—are not infested, while many of the larger of older growth, are like those sent herewith. I am very glad indeed that the pest has been discovered soon enough to have the infested plants destroyed before the grubs mature, and I am busy now following up this work. I find that to detect the borer the roots must be snapped, which they do much easier than sound roots."—[R. M. Palmer.]

"Victoria, December 31.—In regard to the gooseberry bushes infested with larvæ of *Xylocrius Agassizii:* the plants were sent into the province from Oregon—shipped by the Oregon Wholesale Nursery Co., of Salem, to Victoria, in November, 1897. In all, 500 plants were condemned. These were a portion only of a shipment of

Fig. 23.—The Black Gooseberry-borer: infested stem—reduced ⅓.

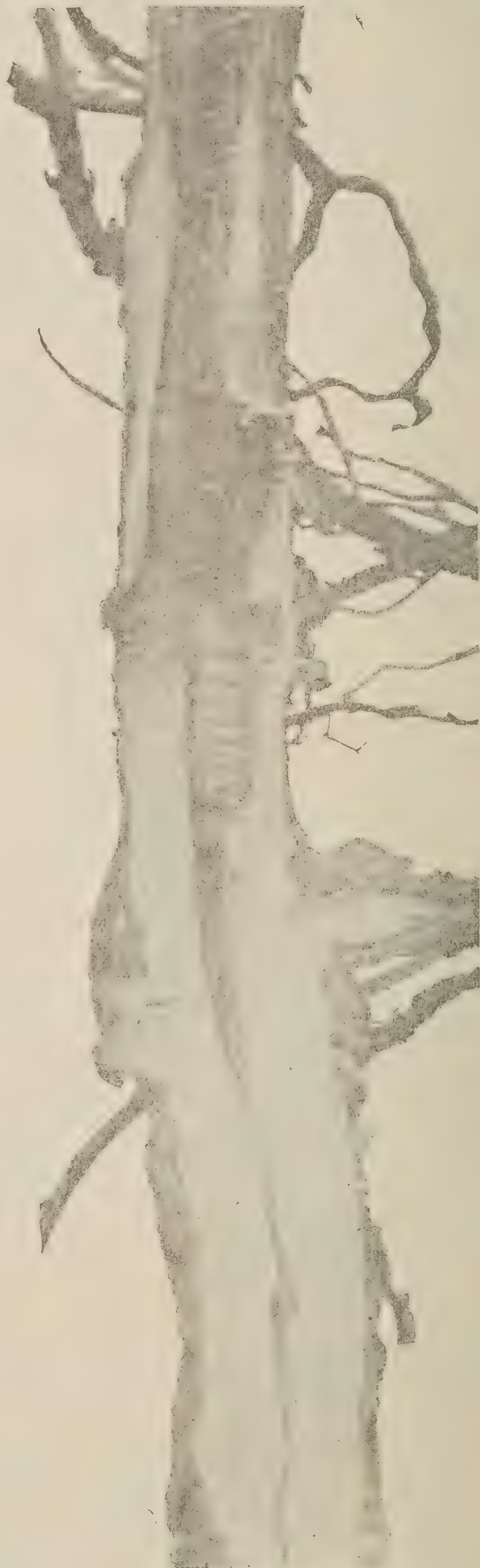


Fig. 24.—Larva in stem—slightly enlarged.

10,000 plants, and every package or bundle of the plants found to contain infested bushes was condemned and destroyed excepting only the specimens which were retained

for investigation, and some of which were forwarded to you. Upon referring the matter to the shippers of the plants, they stated that the stock was not grown by them, but bought from another nursery in their neighbourhood, and that the pest was altogether new to them. Mr. H. E. Dosch, of the Oregon State Board of Horticulture, also wrote in regard to the pest that he had not found it in Oregon in the course of his experience, which would indicate that its occurrence in Oregon as a fruit pest is, at least, unusual.

"I shall be glad to know where the borer belongs, and its usual food plants, if you can supply the information. I had supposed is was a species native to Oregon, and that it probably fed naturally upon indigenous plants.

"I feel quite safe in stating that there is no possible chance of any of the insects from this lot of plants having escaped destruction, but in view of the fact that large quantities of gooseberry bushes have been imported from Oregon for many years past, it is quite possible that it may exist in the province, and I propose to examine closely for it all plants which come under my observation. I am glad to say that Mr. E. A. C. Gibson has been successful in rearing mature specimens of the insect and is forwarding some to you as well as capital photographs of the larvæ and pupæ as they occurred in the plants.—[R. M. Palmer.]

In reply to an inquiry as to the occurrence of the Black Gooseberry-borer as an enemy of the gooseberry on the Pacific coast, Prof. A. B. Cordley, Entomologist of the State Agricultural College, at Corvallis, Oregon, writes: "The attack of *X. Agassizii*, which you describe, has never come under my notice, and I hardly think that this borer could have appeared in injurious numbers of late years in this State, or I should have heard of it."

Mr. Carew-Gibson, who by successfully carrying through to the perfect form three specimens of this very rare insect, has added one more to his triumphs in the investigation of the life-histories of insect pests, has forwarded to me the following notes upon this species:—

Notes on the Black Gooseberry-borer by Mr. E. A. Carew-Gibson.

The gooseberry bushes from which the specimens sent you were reared were brought into this province in a consignment of 500 two year old gooseberry bushes which came from the Oregon Wholesale Nursery Co., late in the fall of 1897. At the time of their importation no signs of the presence of the borers could be detected. The bushes were heeled in when received, and the damage done by the borers was first noticed in the spring of 1898, when the bushes were being planted out. Later on, after a thorough further examination, the whole of this consignment of 500 bushes was condemned by the Inspector of Fruit Pests and, except those bushes kept for experimental purposes, was destroyed under the inspector's direction. On inquiring from the Oregon Wholesale Nursery Co., it was ascertained that these bushes were not really their own stock, but had been bought from a neighbouring nursery to fill up the order.

The larva of which you can form a very fair idea both from the photo I send and from what you saw of them while here this summer, seems able to adapt itself very readily to its surroundings. I have now (31st December, 1898) a grub from the same lot of bushes which I took from a stem on 12th September, when it appeared to be full grown, and placed in a small glass phial tightly corked. It is still alive and wriggling; for the first two months it appeared undecided as to whether it would pupate without further food or not, later it began gnawing the cork of the phial, and it has now worked its way into the centre of the cork. One of the grubs pupated on 19th August (see photo) and the adult beetle appeared on the 18th day after, although at the time it was still soft. On opening another twig on 13th September I found another adult beetle apparently ready to emerge. There only appeared to be a single grub in each affected tree, and as the bushes were small this proved a very wise arrangement, as there would not have been room for more than one. The grub generally starts in from a convenient crotch somewhere about where the branches make a fork, it then works downwards, apparently wintering in the roots, in one case I noticed that it had worked so near to the soil that there must have been only the thinnest possible covering between it and the

soil, it then appears to work upwards in much the same way as the Raspberry Cane-borer, and after reaching some inches above ground, having first made a chamber with only the thinnest possible covering dividing it from the air, it pupates. I am sending you the only additional specimens I have for identification purposes, and these I take to be the larger the female, and the smaller the male; you will note considerable difference in their size. I caged these two beetles on a living bush inside a large glass on my table on 14th September; on the 15th I found an egg resting in the crotch formed by a thorn on one of the twigs, but I lost this egg while examining it under the microscope; it was very small and had its surface beautifully ornamented. 21st September, female apparently dying, male still very active. 22nd, female dead; on the 27th the male was still strong. I could discover no more eggs.

E. A. Carew-Gibson.

The specimens of the beetles sent by Mr. Carew-Gibson proved to be two females and a male of the rare longicorn bettle above-named. I am indebted to Mr. W. H. Harrington and Dr. L. O. Howard for the exact identification of the species. Through the courtesy of Dr. Howard also, the beautiful figure 22 given above has been specially drawn for this report by Miss L. Sullivan, the accomplished Artist of the Division of Entomology, at Washington, D.C, under the supervision of Mr. F. H. Chittenden of the same Division. Figures 23 and 24 are from photographs by Mr. Carew-Gibson.

The genus *Xylocrius* is characterized as follows by Leng in the *Bulletin* of the Brooklyn Entomological Society, vol. VII., p. 113.

"*Xylocrius*, Lec.—This genus presents another remarkable form. The antennæ are very stout, quite hairy, the thorax very convex and rounded at the sides, the elytra constricted behind the base and strongly rounded at tip, and the entire surface deeply punctured and pubescent. Two species have been distinguished:—

More slender; elytral punctures before middle gross, somewhat confluent, surface shining; behind middle, punctures finer, surface opaque.......... *Agassizii.*
More robust; surface all shining; punctures large, foveate, irregular, more or less confluent....... ....*cribratus.*

"*X. Agassizii*, Lec. (*Proc. Ac. Phil.*, 1861, p. 357)—The hair behind the middle of elytra is more dense; 3rd and 4th joints of antennæ about equal. Length, ·45 inch =12 mm. Habitat: California.

"*X. cribratus*, Lec. (S. M. C., 1873, No. 247, XI., p. 172).—Pubescence equal throughout; 3rd joint of antennæ one-half longer than 4th. Length, ·55 inch=15 mm. Habitat: California, Nevada."

The following description was made from the three specimens sent by Mr. Carew-Gibson:—Length, male, $\frac{3}{8}$ inch; female, $\frac{1}{2}$ inch. Colour, deep dull black; whole body covered with downy, rather sparse, pubescence; erect bristles on head and thorax; elytra slightly constricted in the middle; thorax and humeral half of elytra coarsely punctate; apical half, velvety, silky, opaque; abdomen of male shiny black, of female piceous; antennæ rather short and stout, of about the same length in both sexes; thighs swollen in both sexes; general appearance between *Asemum* and *Callidium.*

SPRAYING.

From every province overwhelming evidence proves the very great value of spraying fruit trees for the prevention of damage by both injurious insects and fungi. Owing to the large amount of capital invested in fruit farms and the permanent nature of the plantations, a great deal more attention has been devoted to the enemies of fruits than to those of any of the other ordinary crops which occupy the land for only one or two years, or even less. The consequence is that the habits of these pests are pretty well understood and standard practical remedies have been devised for most of them. These have been made known widely by means of official reports, agricultural periodicals and the daily press.

Up-to-date fruit growers know well the advantages they derive from attending carefully to the work of spraying their crops. It is very seldom now-a-days that one hears from practical business men engaged in fruit growing the childish, illogical excuse that they have not "had time" to spray their trees, as these men know well that "spraying trees" and "making money" are almost synonymous terms. There are now to be had free for the asking in Canada publications setting forth the advantages of spraying and giving full instructions as to the best way to prepare and apply simple, cheap and effective remedies for almost any insect or fungous disease that is likely to be found injuring orchard crops. Indeed, to those who have thought upon this subject it may seem unnecessary to again draw attention to this matter in an official report; but in travelling through Canada, notwithstanding the fact that many of the provinces have able and enthusiastic officers who are doing their utmost to teach farmers the great benefits which they may derive from this simple method of protecting their crops, I find that there are thousands of fruit growers everywhere who have never had enterprise enough to follow the advice given. Knowing well, after many years study of this subject, what enormous saving may be made for the whole Dominion through the sure advancement of every individual, I again draw attention to some statements by reliable men, which I trust may have the effect of persuading more of our Canadian fruit growers and farmers that *spraying does most decidedly pay*, and, as far as I have seen, successes follow intelligent, careful and conscientious effort, much more surely in the case of spraying fruit trees than in any other branch of agriculture or of most other walks of life.

"Much loss has heen caused by insect pests. The apple crop in particular suffered much from worms in unsprayed orchards." (*Ontario Crop Report*, Nov., 1898.)

"Wolfville, N.S., Dec, 1898.—Cankerworms have been less abundant this year than usual, but some orchards in Grand Pré and Avonport were stripped. Where spraying was practised, very little damage was done.

"Spraying with Bordeaux mixture and Paris green combined is now generally practised by most of our best fruit growers, both before and after blossoming. They know that it pays them to do so, and is necessary if they are to secure fruit which will bring the highest price. The methods, however, are evidently not as yet thoroughly understood; for some varieties of apples have been somewhat injured in appearance this year, *i. e.*, they are russeted by a too strong solution, or perhaps too frequent applications; but practice and experience will soon give the necessary skill to get the happy medium between over and under dosing."—[R. W. Starr.]

"The day of good crops of fair apples, *without effort*, is for ever gone, unless conditions change greatly, but the prospects were never higher for the pains-taking, thorough orchardist. If any one needs a full, conclusive, and final demonstration that spraying is a necessary part of apple culture, let him look at almost any unsprayed orchard, then compare it with any sprayed orchard which he may find. If he does not see the difference, if he cannot find evidence that spraying has paid 500 to 1,000 per cent, it will be because he is not open for conviction." (Extract from *Report American Pomological Society*, in Nova Scotia *Crop Report* for November, 1898.)

"Victoria, B. C.—Most of the pests and diseases of fruit trees found here have been successfully dealt with by simple remedies which have been recommended through Bulletins and Reports. Enormous advantage has followed the adoption of spraying, and the feeling of uncertainty as to their success which certainly existed at one time in the minds of many of our fruit growers, is gradually being removed. Those who attend to their business properly are, as a rule, well satisfied."—[R. M. Palmer, Provincial Inspector of Fruit Pests.]

In this connection, special attention may be drawn to the series of spraying experiments which have been carried on during the last four years by instruction of the Hon. John Dryden, Provincial Minister of Agriculture and Arts of Ontario. These experiments were at first supervised by Mr. A. H. Pettit, of Grimsby, Ont., and for the last three years by Mr. W. M. Orr, of Fruitland, Ont. A great many orchards in all parts of the province have been sprayed under the personal supervision of the inspector. Fruit growers in the different districts have been invited to be present at these demons-

trations and receive instruction in the way to prepare the materials and apply them. At the last Industrial Fair held at Toronto in September, 1898, one of the most instructive exhibits was undoubtedly the display of fruit taken from sprayed and unsprayed trees in the same orchard. In this collection, which attracted naturally much attention, there were exhibited about 250 plates of fruit from 24 different localities, those from sprayed and unsprayed trees being placed in separately side by side for easy comparison. The fruit was sent in by the owners of the different orchards where the experiments had been carried out, and was not seen by the inspector until they arrived in Toronto, to be arranged and placed on exhibit.

In a most interesting report upon these experiments which was read by Mr. Orr, at the last meeting of the Fruit Growers' Association of Ontario, held at St. Catharines, Ont., in December, he stated that this year he had worked at 30 points covering the province from Amherstburg to Renfrew. The agents visited each point seven times and his dates were announced by poster, postal card and in the press, so that as many as possible might know when these experiments were to be carried on. That the farmers appreciated this effort of the Ontario Government to benefit them and demonstrate to them the best methods of caring for their orchards, is shown by the fact that over 3,500 attended, besides many who visited the orchards at other times when the agents were not there. This is almost double the number who attended two years ago. There was always kept on hand a good supply of the spraying bulletin issued by the Ontario Government which had been revised and brought up to date, and a copy was given to all who wished to receive it. Work was simplified as much as possible, only one solution being used, viz., the ordinary Bordeaux mixture and Paris green, of the strength advised for orchard use: Copper sulphate 4 lbs., fresh lime 4 lbs., and water 40 gallons, Paris green 4 ounces. Notwithstanding the fact that on account of the law which forbids the spraying of fruit trees when in full bloom, and on account of inopportune rains, many applications were lost, as it was necessary to do the work upon the exact dates and at the hours advertised, so that the agent might keep his engagement at the next point he was due at, the results on the whole were most satisfactory, as is clearly indicated by the enthusiasm of some of the orchard owners on whose trees the experiments were carried out. In estimating the percentage of perfect apples, a part of each tree was picked clean and the fruit was carefully examined, every specimen which had a worm or a spot, no matter how small, being rejected as imperfect. This report will be published in full by the Fruit Growers' Association of Ontario, and will contain the reports of the individual owners of the orchards. In concluding his report, Mr. Orr, who is a practical fruit grower, says: "It appears from results obtained in experimental work that from 65 to 80 per cent of perfect fruit can be secured when spraying is regularly and properly done and when the conditions are favourable."

It is perhaps not worth while now devoting more space to this subject; the facts are well known and taken advantage of by all enterprising horticulturists who keep themselves posted on all the subjects which materially affect the profits of their labours. Those who do not know and do not by spraying save every year more than 25 per cent of nearly every crop they grow from the ravages of their many insects and fungous foes, at any rate have not the excuse that they have not had every opportunity of learning.

Every year, as the time for spraying and otherwise treating crop plants comes round, horticultural publications and the weekly and daily press contain articles giving the experience of practical men who have tried these methods and at the same time full advice as to the best way of carrying on the work.

THE APIARY.

I submit herewith Mr. John Fixter's report as manager of the apiary. This branch of the work has been left entirely in Mr. Fixter's hands. It must be attributed to his good management and skill that the bee department this year has become so popular. Meetings of bee-keepers were addressed by Mr. Fixter, at the following places:—Duncanville, Bell's Corners, Merivale, Rockland, and Bearbrook, all in the Ottawa district.

The season for bee-keepers has been a remarkably good one. The clover crop was better than has been seen for many years in Ontario and Quebec, and all shrubs bloomed profusely in early spring.

REPORT OF MR. JOHN FIXTER.

Experiments in Wintering, 1897–98.

The following seven experiments have been tried: Four were tried in the cellar (Nos. 1, 2, 6 and 7), one in a root-house (No. 3), one in a pit dug in a hill side (No. 4), and another in the House Apiary (No. 5).

The cellar is below a private house. The walls are stone and the floor cement. The bee-room, 11 feet 6 inches wide by 15 feet long and 7 feet high, allows three tiers of shelves and two passages. It is boarded off from the remainder of the cellar by a partition which extends all around the chamber, and far enough from the stone wall to allow of a small air space. Under the cement floor a layer of small stones 8 inches thick acts as a drain and keeps the cellar perfectly dry. The lowest shelf is 18 inches from the floor, the second 20 inches in the clear above, and the third 20 inches above that. Neither the hives on the third shelf nor the uprights supporting the shelves touch the ceiling, so that no vibration can reach the hives from the ceiling. This chamber is thoroughly ventilated, also the whole cellar. There is a three inch pipe passing through the bee chamber up to a stove pipe provided with a damper with which to regulate the draught.

Before entering the bee-room is a smaller room with a door leading outside and another leading to the bee-room; both rooms are provided with sliding ventilators, so that outside air may be let in at will. Ventilation is carefully attended to and sudden changes of temperature are avoided; for this, a thermometer which is always kept in the cellar, is watched. The best temperature for the bee cellar has been found to be from 42 to 46 degrees Fahrenheit.

This arrangement has given entire satisfaction. In former years there was not proper ventilation, and the cellar was always damp. Since the concrete floor has been laid and the ventilators put in, the cellar has been much drier and cleaner. It is also rat and mouse proof, which is a very great advantage. The difference in the consumption of honey by the bees is marked, the quantity being now only half what it was before the cellar was improved. The coal stove which was formerly in the smaller room to keep a uniform temperature and to keep the cellar dry, has been abandoned, as the cellar and hives can be managed so as not to require it. I would not recommend any one to use artificial heat.

Experiment No. 1.—Eight colonies were put into winter quarters in the cellar and placed on the shelves. Under the back end of each hive was placed a three-inch block, by which means the back of each hive was raised so as to insure free ventilation. Each hive was besides raised from its own bottom board by a small three-eighths of an inch block placed at the back. All front entrances were left wide open, the wooden covers all removed, and replaced with cushions made of chaff 4 inches thick, and wide and long enough to lap over the hive 2 inches.

Temperature was taken once a week all through the winter:

November, 46 to 47 degrees.	February, 46 to 50 degrees.
December, 47 to 48 "	March, 48 "
January, 44 to 46 "	

The bees were quiet, only a very slight hum being noticeable up to February, when, the temperature having risen to 50, the bees began to get uneasy and make considerable hum. Cold air was carefully let in during the night by opening the slides in the doors at night and closing them in the morning; this lowered the temperature and the bees quieted down. During the past winter every colony in this experiment was perfectly dry and clean, and all came out in excellent condition.

Average weight of each hive when put into winter quarters, 53½ pounds; when taken out on 26th March, 44½ pounds per hive, showing that each hive had lost 9 pounds on the average, which is very much less than the usual amount. This small amount is owing to the comfortable cellar. In former years, before this same cellar was arranged as it is, the hives lost on an average 20 pounds, which represented the weight of honey consumed during the winter.

Experiment No. 2.—Two colonies were put into the cellar on 12th November, with tops and bottoms of the hives left on, just as they were brought in from the bee-yard. They were watched for dampness, and to compare the amount of honey consumed. Temperature of cellar the same as in No. 1. During December and January both hives made considerable hum. 27th December, drops of water were noticed all along the entrance of both hives. This same trouble continued in January, when they were both given more ventilation at the bottom by a three-inch block being placed in front between the bottom board and the brood chamber. During February and March both hives got perfectly dry and quiet. 26th March, both hives were removed to their summer stands in fairly good condition; one had spots of fæces on the entrances; both hives were damp and the combs were slightly mouldy, but there were very few dead bees in either hive. Average weight of each hive when put into winter quarters, 62½ pounds; when taken out on 26th March, 48 pounds, showing that each hive had lost 14½ pounds per hive. Another examination was made on 23rd April, when both were found building up rapidly as the season was favourable. 21st May, both in excellent condition for a honey flow.

Experiment No. 3.—Two colonies stored in a root-house. The hives were placed on a shelf nailed up against the wall, about 3 feet from the ceiling and projecting 2 feet. A curtain was hung from the wall over the top and down in front of the hives so as to keep out all light; wooden covers removed and replaced with a chaff cushion. A strip of wood 2 by 2 inches was placed all along both sides between the brood-chamber and the bottom board, so as to give more ventilation at the bottom, both back and front were left wide open. In former years the hives kept in the root-house did not appear to have ventilation enough; this extra space has proved very satisfactory. Temperature was taken every Monday of each week. November, highest temperature, 38, lowest 36; both hives quite dry but very noisy. December, highest temperature, 42, lowest 36; both colonies were very noisy, but were perfectly dry; mice had found their way into both hives and disturbed the bees; some strips of tin put around prevented them getting in again. January, highest temperature, 41, lowest, 39; during January, both hives had drops of water along the entrance and were making considerable sound; no trouble from mice this month. February, temperature 38 to 39, both hives were very much drier, and by the end of the month they were perfectly dry and fairly quiet. March, highest temperature 40, lowest 36, both hives were very noisy and quite damp. 26th March: Both hives removed to bee-yard. Both colonies showed signs of dysentery, dampness and mould, but were very strong in numbers.

Average weight of each hive when put in in autumn of 1897, 57 pounds, 12 ounces; spring 1898, 44 pounds, 12 ounces; a loss of 13 pounds. On 23rd April another examination was made. Both hives were building up and in excellent condition for a honey flow.

Experiment No. 4.—November 12. Two colonies were put into a pit dug in the side of a hill, 3 feet deep, 3 feet wide, and 10 feet long, in such a way that the ventilators

at both ends might not be immediately above the hives, which were in the middle of the pit. The hives rested on two cedar poles laid along the full length of the pit. The ventilators, which were 3 inches by 4 inches, were made of boards, three of which reached down to the bottom of the pit, the fourth only to the top of the pit, and the ventilators rose 3 feet above the ground, wooden covers removed and replaced by chaff cushions. In each hive 2 by 2 inch strips of wood were laid under both sides and under the back end between the brood chambers and the bottom boards, so as to provide more space at the bottom of the hive in case a quantity of dead bees should accumulate there. The pit was covered with cedar poles laid along its length, the middle ones higher than the others, and these covered with a layer of straw and one foot of soil. A small shaft was also arranged between the hives, down which a thermometer could be lowered by means of a string, so that the temperature of the pit could be ascertained Temperature was taken once each week. From November to March the temperature did not go below 38 nor above 39. On 26th March the pit was opened, when it was found that water had got in and risen half way up the hives, both colonies appeared to be fairly strong in numbers, combs were badly moulded. On 5th April one hive was noticed to be very weak. On 23rd April it was deserted. The other hive came through well, and on 23rd April was building up rapidly.

This experiment did not come out as well as in former years, owing to the water getting into the pit. This water came from a trench dug above the pit, with no outlet but into the pit. There was no trench dug in former years and no water had troubled.

It will also be noticed no straw was put in the pit over and around the hives as in former years. We find it much better without any straw. Weight of each hive in the autumn of 1897, 62 pounds, and in the spring of 1898, 50 pounds 6 oz., a loss of 11 pounds 10 oz. each.

Experiment No. 5.—Wintering in House Apiary.

Two colonies Nos. 47 and 48, were left in the house apiary with some additional packing. The House Apiary faces the south, the walls are double boarded, with an air space of four inches. The floor, which is about one foot from the ground is also double boarded and there is no draught under it. The hives were moved one foot from the wall, and placed on a double thickness of sacks laid on the floor; the wooden covers were removed and replaced by chaff cushions. In addition to this, the hives were covered above and all around with a double thickness of the same sacking. Also 1 foot of cut straw was put below and all around. A small shaft 1½ inch square extended from the opening of each hive to the outside of the shed; 2 inch strips of wood were placed under both sides and under the back, between the bottom board and the brood chamber, so as to give more space at the bottom of the hive in case a quantity of dead bees should accumulate.

No flying took place from 12th November, 1897, until 7th March, 1898, when several bees flew out but were not seen to return. On 8th March they were flying briskly going out and returning. From 8th March to 26th they flew 9 days.

On 26th March they were unpacked: Hive No. 47 had 2 inches of dead bees on the bottom board and was in a very weak condition. Hive No. 48 also had 1 inch of dead bees on the bottom board but appeared to be in better condition than No. 47.

Another examination was made on 21st April, when hive No. 47 was found to be deserted, the combs were quite dry and clean and there was plenty of sealed honey in the hive.

Hive No. 47 weighed in the autumn of 1897, 54 pounds, and in the following spring 34½ pounds, showing a loss of 19½ pounds. Hive No. 48 weighed in the autumn of 1897, 56 pounds, and in the following spring 39½ pounds, a loss of 16½ pounds.

Experiment No. 6.—Two colonies were put into the cellar with bottoms of the hives left on, just as they were brought in from the bee-yard. The wooden covers were removed and nothing left on except a tightly sealed propolis quilt, the entrance was left wide open. During the entire winter the bees kept perfectly dry, and very slight hum could be heard.

March 26th.—Both hives removed to bee-yard; appeared to be in excellent condition; there were scarcely any dead bees and the hives were dry and clean.

Total weight of the two hives when put in, 104½ pounds; when taken out, 83 pounds, a loss of 10 pounds 12 oz. each. Another examination was made 21st April, when they were both found to be building up rapidly and in excellent condition for a honey flow.

Experiment No. 7.—Two colonies were put in the cellar and placed on the shelves, a three inch block being placed between the bottom board and the brood-chamber only *in front*, making the full entrance 3 inches high across the whole front. The wooden covers were removed and replaced with a chaff cushion. Temperature same as No. 1.

During the whole winter both colonies in this experiment were perfectly dry and clean and showed no uneasiness of any kind. They came out in the spring in excellent condition.

Average weight of each hive when put into winter quarters 58¼ pounds; when taken out on 26th March, 47 pounds 10 ounces, showing that each hive had lost 10 pounds 10 ounces.

Conclusions.

Experiment No. 1.—Has given entire satisfaction for the past four years. The amount of honey consumed during the winters per colony was in 1894-95, 12 pounds 9 ounces; in 1895-96, 10 pounds; in 1896-97, 9 pounds 6 ounces; 1897-98, 9 pounds; or an average for the four years, 10 pounds per colony.

Experiment No. 2.—Hives put in the cellar as they came from the bee-yard had not sufficient ventilation. This result agrees with that of the past three winters.

The amount of honey consumed during three winters was: 1895 to 1896, 13 pounds per colony; 1896 to 1897, 11 pounds 8 ounces; 1897 to 1898, 14 pounds 8 ounces; or an average for the three years of 12 pounds 13⅓ ounces each. Although the amount of honey consumed is not large, the vitality of the bees was not as good as in several of the other experiments tried.

Experiment No. 3.—Wintering in a root-house. This experiment was again fairly satisfactory; although an extra space of 2 inches was given at the bottom, the hives were damp and mouldy. Considering the amount of disturbance the bees are subject to in this experiment, I would consider they came out well.

Once or twice each week the large doors of the root-house were thrown wide open to allow the teams in to draw the roots out, and this let in much cold air which came suddenly upon the hives; also the teams, drawing over the floor, jar them very much. The amount of honey consumed per colony was in 1896-97, 14 pounds, and in 1897-98, 14½ pounds.

Experiment No. 4.—Wintering in a pit dug in a dry hill side. This experiment has been very satisfactory. The past year a misfortune happened; when covering the pit a trench was dug in such a way that water could not run out of it and finally got into the pit. The amount of honey consumed per colony in 1896-97 was 9 pounds, in 1897-98, 11 pounds 10 ounces.

Experiment No. 5.—Wintering in a House Apiary. This experiment was again a failure. The extra packing with 1 foot of cut straw was not sufficient to keep out the cold. I would not advise any one where the temperature reaches 15 below zero to winter in a house apiary such as described in No. 5 experiment.

The amount of honey consumed per colony during the winter of 1896-97 was 15½ pounds, and in 1897-98 16½ pounds. This shows a larger amount consumed; the condition of the bees when taken out in the spring was besides very weak. The colonies either dwindled out or did very little good the following summer.

None of our experiments in wintering out of doors have given the same satisfaction as those in the cellar, even when extra packing was given.

Experiment No. 6.—Hives put in the cellar as they came from the bee-yard, excepting that the wooden covers were removed, leaving on only the thick propolis quilt. This mode of wintering has given satisfaction the past winter but will be tried further.

Experiment No. 7.—Hives in the cellar raised in front only so as to give very wide opening for ventilation. This experiment was also satisfactory and will be further tried.

SEASON OF 1898.

March 9th being a warm, sunny day, twelve colonies were removed from their winter quarters: six were placed in the House Apiary, and the other six in the exposed apiary, where the snow was about eighteen inches deep. All began to fly at once, and the snow soon became very much spotted with fæces, but there were very few dead bees around the entrances of the hives. The hives in the exposed apiary were covered with coarse sacks as a protection, leaving a very small entrance for the bees. In the House Apiary no such protection was given. From 9th to 26th March the bees flew eight days. The remaining colonies were taken out on 26th March.

From 26th March to 9th April the bees flew five days. On 9th April the first pollen was noticed to be gathered. From 9th to 27th April they gathered pollen very freely off soft maple and willows, also off the Manitoba maple. They were seen gathering sap from hard maples, wherever the trees were cut. On 27th April, a very fine and warm day, all colonies were inspected. Any that were found short of stores were fed with warm syrup. For this an empty frame was taken out and held slightly slanting, the syrup was poured on the empty comb until every cell was filled, then the frame was returned to the hive. This plan of feeding answers very well for spring, but not for autumn feeding. The first new honey was noticed on 1st May. Up to 1st May the bees in the house and sheltered apiaries appeared to work better than those in the exposed apiary. On many days when the weather was cool, they were flying well, while none of the others were flying. Those set out early appeared to be in the best condition, as they had several cleansing flights before the others were set out.

May was very fine and warm. The bees worked unusually well, gathering honey and pollen from maples, apple, plum, cherries, Siberian pea-tree, buckthorn, and also from dandelions, buttercups, white and alsike clovers. On 27th May two fine swarms came off; one from the house apiary, and one from the sheltered apiary. Supers were put on all the hives which were full of bees. Many at once began to work in them.

June was very favourable for the bees to work, white and alsike clover being abundant, very much honey was stored in the supers.

July 4th, all supers containing clover honey were removed to a warm room, where the temperature was not lower than 65°. We have found by experience that honey kept in a cool or damp room does not ripen properly. The basswood was just then coming into bloom; the bees gathered considerable honey from it up to 20th July. The supers containing basswood honey were removed on 25 July, as the buckwheat was then beginning to bloom.

On 3rd August when the buckwheat was ploughed under as a fertilizer, the bees had already gathered much honey from it. From 3rd to 18th August the bees were working well on the second growth of alsike and Bokhara clovers. On 18th August all supers were removed, and any honey gathered after that date was left for winter stores. All the colonies were carefully examined at this date to see if they were good and strong, and had a good laying queen. Several were found queenless, and were at once supplied with young queens. It is very important to see that there are no caterpillars of bee-moths around or in the hives. If any traces of moths are noticed these should be cut out at once, and the hives examined at short intervals afterwards.

September 1st to 12th the weather was fine and warm; there was considerable flying. All the hives were weighed, and any that did not weigh over 50 pounds were given full frames of sealed honey. The beginning of September is a good time to inspect winter stores. If syrup has to be fed, the bees will take it down better when the weather is warm, and will thus have a chance to seal it over, which is very important for wintering. But rather than feed syrup to the bees, I would strongly advise every bee-keeper, unless he is thoroughly experienced, to save a few frames of sealed honey in case his bees have not enough to carry them through the winter. He will find it to his advantage to place one or two full frames in the hive in preference to feeding syrup. Feeding syrup to the bees in the autumn gives them a tendency to rob. A good receipt for bee syrup is the following: Boil the water, then remove it from the stove, add at once two parts of granulated sugar to one part of water (by weight) and stir until dis-

solved. It may then be fed to the bees moderately warm in the evening. The old method of dissolving the sugar while the boiler is on the stove is unadvisable as the sugar is liable to be burnt, which would be harmful to the bees.

In order to secure a provision of frames filled with syrup, the best way is to get the strongest colonies to fill and seal them. For this purpose an extracting super is placed on the top of a strong colony, to which syrup is then fed. The bees will then work and fill the frames in the super with syrup. When the frames are filled they are removed and afterwards given to the colonies that require to be fed. If weak colonies were fed in many cases they would be robbed by the stronger ones.

Experiments with Foundations of Different Sizes in the Sections.

There were two objects in view in these experiments. One was to find out which size of foundation the bees would start to work on first; second, to find out which sections would be filled best and have the fewest empty cells around the sections. Several supers were used having the sections so arranged that all would have an equal chance of being filled.

Experiment No. 1: sections with full sheets of foundation fastened on top only. Experiment No. 2: sections with half sheets of foundation fastened on top, and experiment No 3: one inch square of foundation fastened on top in the centre.

In every instance, the bees worked first on the full sheet, and these sections when finished had the fewest holes or empty spaces around them. In the sections which had half sheets of foundation the bees did not work as soon as on the former ones, and the sections were not so well filled. The sections which had one inch square of foundation sheets attached to the top were the last worked on. They also had most vacant spaces around the sections. These experiments should be tried again, also others with pieces of foundation attached at different points around the sections.

House Apiary.

The House Apiary was again tried, and in 1898 to a greater extent than former years. Two tiers of hives have been put in, one on the floor which is one foot from the ground. The second tier was set on a shelf 3 ft. 6 inches from the floor. This plan can be safely recommended for cities or towns where space is scarce, and two tiers can be arranged as well as one in the same building. It has many advantages for the summer, but fails for the winter. See former reports.

Returns.

The past season has been a very good one. The returns of the Central Experimental Farm Apiary for the season of 1898 show an average of 78 sections per colony. The colonies which were run for extracted honey gave 94½ pounds per colony.

Swarming for the season on the whole has been satisfactory. Colonies should not be allowed to give more than one swarm in a season. Excessive swarming may be prevented by the following method: As soon as a colony swarms out and the swarm is well settled, hive it. Remove the hive that it came out of to another stand, then place the new hive on the old stand. Many of the workers returning from the field will help to build up the new colony. If the old colony is found to be still very strong take out two or three frames and shake the bees off in front of the newly hived swarm. This will weaken the old colony and prevent it from swarming again. You will then have a good strong swarm in the best shape for gathering honey.

JOHN FIXTER.

FARM STOCK.

THE HORN-FLY (*Hæmatobia serrata*, Rob.-Desv.).—In the provinces of Ontario and Quebec the Horn-fly was reported as being slightly more troublesome than last year. This was also the case in some places in Nova Scotia, but at most places the annoyance was less. In Prince Edward Island, where this year it was expected to give more trouble than elsewhere, Father Burke writes from Alberton, P.E.I.: "The Horn-fly was not so bad early in the season as in other years, as the wet weather was fatal to the larvæ, but later it was a troublesome pest and, I feel sure, was as numerous as in its first years here. People did not oil so systematically or persistently, and this may have been the cause. I do not think that any effort is being made to disturb the cattle droppings in the fields where the flies breed."

Remedies.—These consist of applying to the animals some oily substance obnoxious to the flies to prevent them from biting. Of many kinds tried, Mr. Robert Elliot, the Herdsman at the Central Experimental Farm, has for 2 or 3 years used when necessary a mixture of 1 pound of pine tar in 10 pounds of lard, and still finds it the most convenient and effective remedy.

Regularly spreading out the fresh cattle droppings in the field with a rake, so that they dry up and become unfit for the maggots to breed in, has been found an easy and useful remedy. The eggs are laid by the flies at once on fresh droppings, and if these are disturbed every other day in the favourite places in pastures where the cattle congregate, large numbers of the larvæ are destroyed.

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

To Dr. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the pleasure to submit to you the eleventh annual report of the Poultry Department.

The operations of the year are explained in detail. It is gratifying to note that notwithstanding the reduction in daily rations from three to two, made the year previous, there was an increase in the number of eggs laid last winter season, the period of high prices, and which was one of the objects aimed at. Experience shows that the obtaining of eggs in winter, in the colder districts of the Dominion, is an exact science. If too much, or too stimulating food is given, disaster follows. If the rations are too stinted, there is no satisfactory result.

As further experience is gained, there is every reason to hope for still better results, at further reduced cost.

It is worthy of remark that notwithstanding the increased number of eggs laid by the hens of the farmers and the large quantities held over, in cold storage, that the prices in late fall and early winter, in Ottawa and Montreal, were little, if at all, affected. A letter received from Mr. Walter Paul, a leading grocer in Montreal, by the writer, reads as follows :—

"MONTREAL, 18th Dec., 1898.

"DEAR SIR,—Your favour of 16th instant received. I am getting lots of fresh eggs. I am paying 40 cents per dozen here for the best. They are all fresh from farmers. I will not take any eggs from storekeepers. I get eggs from as far west as Chatham, Guelph, Cobourg, Belleville, &c.

"Yours truly,

WALTER PAUL."

Mr. W. J. Wilson, poultry breeder, Amherst Park, Montreal, writes: "I am receiving 40 cents per dozen just now for all the eggs I can get."

The price in Ottawa, at the same time, to farmers was 35 cents per dozen.

Prices such as quoted offer a large margin of profit to farmers, who will doubtless be most interested in the details given in report herewith, as to the composition and effect of the less bulky and costly ration.

I have to acknowledge the present of 16 Pekin duck eggs from Mr. A. Thompson, the well-known breeder of Allan's Corners, Que., also a setting of Buff Leghorn from C. R. Frith, Esq., M.D., of Winchester, Ont.

During the year addresses were delivered at the following points :—

London, Peterborough, Owen Sound, Cobourg, Baltimore, Pakenham, Madoc (2), Perth and Smith's Falls. At the first four places named, displays of dressed poultry were made.

It affords me pleasure to again remark on the faithful and zealous discharge of his duties by Mr. George Deavey, to whose intelligent manipulation of the rations so much of the success in the winter production of eggs is due.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

REPORT ON THE WORK OF 1898.

The work of the past year may be said to have been to a great extent confirmatory of that of the previous one. It is important that it should have been so, for at the beginning of the winter of 1896-97, the rations had been reduced to two *per diem.* While the results were gratifying, it yet remained for the experience of another year to confirm or modify the data then obtained and given in detail in report of last year, 1897. The experience of the past year confirms the beneficial results following the reduction of the rations to two in number. It has also shown that under favourable conditions, such as cheaper price of grain and still further reduction in kind and bulk of rations, it is possible to yet reduce the cost of the daily rations. Indeed this reduction in cost would have been secured last year, but for the increased price of wheat from one cent to one cent and a quarter per pound, and the cost of cut bone from one to one cent and a half per pound. It being remembered that the object is always to have eggs during the winter season, the period of high prices, in as great quantity and at as little cost as possible. It will be interesting then to note :—

1.—The difference in the winter rations of 1896-97 and 1897-98.
2.—The egg yields of the two years so as to permit of comparison.

THE DIFFERENCE IN THE COMPOSITION OF THE TWO RATIONS.

First we take the daily rations for the winter of 1896-97 (the winter before last), which was made up as follows :—

20 pounds wheat, or buckwheat, at 1 cent per pound..........	20
18 do cut green bone, do	18
Grit and vegetables....................................	03
	41c.

The above was fed to 151 hens and 53 pullets, a total of 204.

The feeding of winter rations generally commenced about the beginning of November, sometimes earlier.

The ration was varied by the feeding of warm mash about 3 time per week in lieu of the cut bone. The mash was composed of ground grains in such quantity as not to exceed the value of 18 cents.

THE RATION OF LAST WINTER.

Before giving the composition of the new ration some explanation, as to the manner in which it differed from its predecessor, is necessary. It principally differed in being divided into two parts, viz. :—

Part 1.—For hens one year of age and over.
" 2.—For pullets.

The division was considered necessary, for the reason, that the experience of previous winters had led to the conclusion that the pullets would stand more food and, perhaps, lay better, while the same quantity, if given to older hens would tend to make them so fat as to lay few, if any eggs. The pullets accordingly received more food—were

forced a little more—in the shape of a small quantity of mash every day, while the older hens received it only occasionally. The rations of last winter 1897-98, were composed as follows:—

PART I.—FOR 157 HENS OVER 1 YEAR OF AGE.

10 pounds wheat at $1\frac{1}{4}$ cents per pound		$12\frac{1}{2}$
$1\frac{1}{2}$ " oats at 1 cent per pound		$1\frac{1}{2}$
Grit and vegetables		$1\frac{1}{2}$
Mash composed of—		
Shorts, 3 pounds at 1 cent per pound	3	
Cornmeal, 2 pounds at $1\frac{1}{2}$ cents per pound	3	
Ground oats, 3 pounds at 1 cent "	3	
Small potatoes, 2 pounds at $\frac{1}{4}$ cent per pound	$\frac{1}{2}$	
Blood meal, 1 pound 4 oz. at 3 cents per pound	4	
	—	$13\frac{1}{2}$
		29

Another day 10 pounds of cut bone would take the place of the mash when the ration would be as follows:—

Cut bone 10 pounds at $1\frac{1}{2}$ cents per pound	15
Wheat 10 pounds at $1\frac{1}{4}$ "	$12\frac{1}{2}$
Grit and vegetables	$1\frac{1}{2}$
	29

PART II.—FOR 63 PULLETS.

Wheat, 5 pounds at $1\frac{1}{4}$ cents per pound		$6\frac{1}{4}$
Mash composed as follows:—		
Shorts, 2 pounds at 1 cent per pound	2	
Cornmeal, 2 pounds at $1\frac{1}{2}$ cents per pound	3	
Small potatoes, 4 pounds at $\frac{1}{4}$ cent per pound	1	
	—	6
Grit and vegetables		$1\frac{1}{2}$
		$13\frac{3}{4}$

When cut bone was given the ration would be:

Wheat, 5 pounds at $1\frac{1}{4}$ cents per pound	$6\frac{1}{4}$
Cut bone, 3 pounds at $1\frac{1}{2}$ cents per pound	$4\frac{1}{2}$
Grit and vegetables	$1\frac{1}{2}$
	$12\frac{1}{4}$

Making the total daily ration of one day to cost	$42\frac{3}{4}$ cts.
And when cut bone was fed	$41\frac{1}{4}$ "

As compared with the 41 cents daily ration of the previous year there is a slight increase $\frac{3}{4}$ cents in one case and $1\frac{1}{4}$ cents in the other. But the rations calculated at the price of wheat, of the previous year, one cent per pound and cut bone at 1 cent per pound, would show a decrease in the daily rations for the hens of 7 cents and about 3 cents in the case of the pullets.

THE QUANTITIES IN WHICH THE ABOVE RATIONS WERE FED.

The above rations were fed in the following quantities :—

CUT GREEN BONE in proportion of one pound to 15 or 16 hens.

MASH, composition of which is shown in previous page, about one pound to 15 or 20 hens. To the pullets a little every day.

WHEAT, 10 pounds at one time to 157 hens. To the pullets 5 pounds at one ration. When cut bone was fed only 2 pounds of wheat were given to the pullets.

The rations were fed at various times. For instance, cut bone would be given one day as a morning ration and the next in the afternoon.

The feeding of a small quantity of mash to the pullets every day was continued until the middle of January, when it was fed only three times per week, as the pullets were becoming too fat. It was thus shown that caution was required in pushing the pullets with an extra allowance of soft food. It is to be remembered that by this time the early pullets were well matured, as was to be seen in the increased size of their eggs as well as of their bodies. This was particularly noticeable in the case of the Barred Plymouth Rocks.

REASONS FOR ADOPTING THE ABOVE METHOD OF FEEDING.

The quantities given above may appear a small apportionment for 157 hens and 63 pullets, but (as shown later) vegetables and grit were always in liberal supply. The aim was not only to secure as great an output of eggs at as little cost as possible, but to secure the good health of the laying stock and immunity from vicious practices most frequently met with in the shape of egg eating and feather picking. The experience of past years has shown that active exercise is not only a chief factor in the winter production of eggs, but in the prevention of the two vices named. Experience has also taught that if the laying stock are overfed at the morning ration, as is too commonly the case, they are not inclined for exertion. Hence the object in feeding a light morning ration was to leave the layers ready to search for the small quantity of grain always scattered in the straw on the floor of the pens, soon after the ration was fed. The 5 pounds of oats as shown in Ration 1, for hens, were used for this purpose. The following summary of the manner and purpose of feeding may be useful as furnishing a daily Bill of Fare :—

1. The feeding of the morning ration in light quantity and as early as possible, so as to leave the layers inclined to search for more food.

2. About half an hour afterwards the scattering of a few hands-full of oats, or, other grain in the litter on the floor to incite the layers to exercise.

3. At 11 a.m. the feeding of lawn clippings which had been steeped in boiling water the night previous, for the purpose of supplying a cheap and wholesome form of green food.

4. No noon ration, except in the case of the pullets of late hatch, and which required gentle forcing.

5. About 3 p.m. the feeding of the afternoon ration in the shape of whole sound grain and in such quantity as to send the layers to roost with full crops. The grain was always thrown in the straw on the floor, so as to cause the hens to look for it.

6. The rations were fed as regularly as possible and careful observation made of their effect.

The lawn clippings, which usually came out of the hot water of good colour, were fed in the small narrow troughs fastened to the side of the pens, and were eaten with avidity. They had been gathered during the summer, thoroughly cured and put away. Where lawn clippings cannot be conveniently had, clover will make almost as good a substitute. Cut up into small lengths and steamed, clover is an excellent constituent of the morning mash and should always be in it.

Interior of part of Poultry House showing arrangement of Pens.

NO NOON RATION.

It will be noticed in the above bill of fare that no noon ration is given. It is not necessary in the case of the older hens and as, already remarked, should only be given to the pullets when their condition shows that it is required. If the layers wanted more food, than the quantity embraced in the rations, there were vegetables and roots in the shape of mangels or cabbage before them all the time and they could eat of them. Mica grit and ground oyster shells were always in abundant supply, as was pure water for drink. The vegetables, roots and grit were always eaten in such quantity as to show that they were indispensable. It is necessary to their well-being that the laying stock should eat a quantity of green food and grit and they are not likely to do so if overfed on mash or whole grain. It is imperative to have variety in the composition of and manner in feeding the rations. Experience goes to show that the cheaper foods, which are, as a rule, most abundant on a farm, make the most effective rations.

CERTAIN RULES EXPERIENCE HAS TAUGHT.

The experience of past years has, with other points already mentioned, made it very plain that the observance of certain rules is necessary before there can be an abundant supply of eggs in winter, immunity from vicious practices and the good health of the laying stock. These rules may have been mentioned in previous reports, but they are essential to success and will bear repetition. They are :—

1. Hens of proper age. Not over two years.
2. Varied, carefully prepared and regularly fed rations.
3. Grit, pure drink water and shell making material (in some form) in constant supply.
4. The keeping of the laying stock in as constant activity as possible.
5. A fairly comfortable house, with floor space of about 5 square feet to each layer.
6. The culling out of all non-layers.
7. Freedom of house and layers from lice.
8. Selection of laying stock from the best egg laying strains and of robust parentage. The latter applies with particular force to turkeys.

COMPARATIVE EGG YIELDS FOR THE PAST TWO YEARS.

The details which have been given, in a previous page, show wherein the rations differed in composition and quantity fed. The following tables will show the output of eggs for the years 1896-97 and 1897-98.

	1896–97.	1897–98.
November	568	267
December	1,466	1,469
January	1,540	1,653
February	1,351	1,553
March	1,668	2,063
April	2,139	2,430
May	1,846	1,837
June	1,190	1,115
July	859	389
August	736	325
September	655	428
October	339	300
	14,357	13,829

The above figures show a less number of eggs laid last year. It should be stated that in the season of 1896-97 there were 151 hens and 53 pullets as compared with 157

hens and 63 pullets last winter season, a difference of 6 hens and 10 pullets in favour of last winter. But by comparing the output of eggs during the winter months of the two years, it will be at once seen that a greater number of eggs were laid during the winter months of 1897-98 when eggs were of the most value for eating or setting.

	1896-97.	1897-98.
December	1,466	1,469
January	1,540	1,653
February	1,351	1,553
March	1,668	2,063
April	2,139	2,430
	8,164	9,168

The difference in the total number of eggs for the year may be accounted for by the number of broody hens during the summer months and likely to follow the extra laying of the late months of spring. It will be interesting to note if the lesser egg output of July, August, September and October is followed by a corresponding increase in eggs during the forthcoming winter months of December and January.

CARE AND TREATMENT OF PULLETS.

It is stated in a previous page that the pullets of last winter received a greater quantity of food than did those of the previous one. The determination to give the pullets more liberal rations was not dictated by the experience of the previous winter in the farm poultry department alone. But several correspondents had written to the effect that what were suitable quantities of food for the older hens did not seem enough for the pullets. In one case a correspondent had given the lesser quantities to growing pullets, which was certainly a mistake. While growing, the pullets require to be well fed and cared for and even after beginning to lay they may be gently pushed.

The composition of and quantity of rations fed to the pullets of last winter have already been given. The following will show the response made in the case of three pens of pullets, of late and comparatively early hatching, from beginning of winter laying in November until the breeding pens were broken up at the end of June following:—

Varieties.	November.	December.	January.	February.	March.	April.	May.	June.	Total.	Average
17 White Leghorn pullets	9	113	223	185	154	228	154	85	1,151	$67\frac{12}{17}$
28 B. P. Rock "	14	196	291	329	356	374	260	155	1,975	$70\frac{15}{28}$
10 S. L. Wyandotte pullets	...	8	69	84	98	114	74	42	489	$48\frac{9}{10}$
									3,615	

Among the above were comparatively early and late hatched pullets. Experience has made it clear that it is not advisable to have early and late hatched pullets together, particularly where the obtaining of eggs in winter is an object. Very often such a practice is attended with overcrowding. It is better to dispose of the late hatched pullets than overcrowd the older ones. To overcrowd is to seriously handicap the old pullets. Again, if the house is cold the late pullets most frequently remain non-progressive until spring. If too crowded, meanwhile, they are apt to pine away, and if they do not die, remain immature specimens. Where possible, hens and pullets should be kept apart.

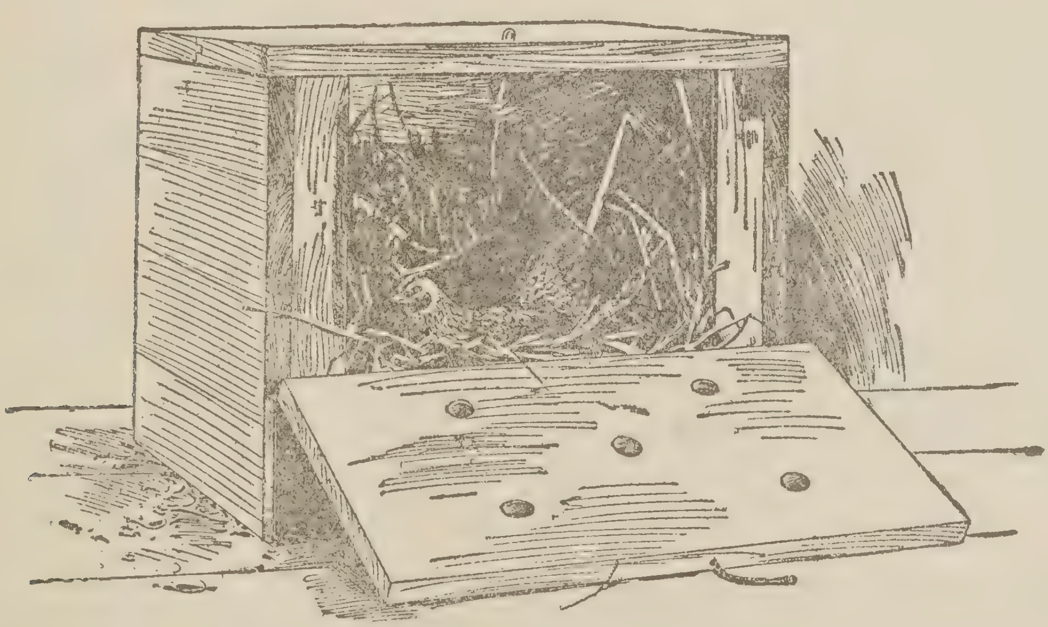
BREEDING PENS MADE UP.

At the end of February and the first week of March the breeding pens were made up as follows :—

Varieties.	Cocks.	Cockerels.	Hens.	Pullets.
Barred P. Rocks, No. 1 pen	1	....	9	....
" " 2 "	1	....	....	13
" " 3 "	1	....	....	12
White P. Rocks	1	....	9	....
Light Brahmas	....	1	9	....
Langshans	1	....	7	....
Coloured Dorkings	....	1	9	....
S. L. Wyandottes, No. 1 pen	1	....	8	....
" " 2 "	1	....	....	8
White Wyandottes	1	....	9	....
White Leghorns, No. 1 pen	....	1	11	....
" " 2 "	1	....	9	....
Brown Leghorns	....	1	2	....
Black Minorcas	1	....	9	....
White "	1	....	15	....
Andalusians	1	....	7	....
Crosses.				
White Indian Game-W. Java	....	1	6	....

On the 17th March the Light Brahma cockerel died suddenly, and soon after was followed by the Langshan cockerel. Both birds were valuable ones. They were replaced as quickly as possible and by equally good birds.

THE SITTING HENS.



Box Nest for setting hen

The sitting hens received no more attention than any careful farmer could have given them. The nests were made of straw arranged in small square boxes, without bottoms and with hinged door in front as shown in diagram.

Having no bottoms, the boxes could be placed on the ground or wooden floor, as desired. The nests were arranged, six or eight in number, in small compartments. Mixed grain, grit and drink water were in supply in each pen or compartment. On the nests being made they were liberally dusted with carbolic, or, other disinfecting powder. Two or three china eggs were then placed in each nest, and the broody hens, first being well dusted with a disinfectant, were placed on the eggs and shut in. Next morning the doors of the nest boxes, would be opened four at a time and the sitters allowed an opportunity to get out, if so inclined. If the newly set hens proved reliable the china eggs were taken away and the valuable eggs 11 or 13 in number—the former if early in the season—were given to them. Meanwhile the insect powder had likely killed any vermin that might have been on the body of the hens. Lice infested hens are not likely to sit at ease and when too much irritated have been known to leave their nests for good. Such precaution is necessary, particularly, where brooding hens are brought—as they often are—from not over clean quarters. Where incubators and brooders are used there is no likelihood of trouble from such a source.

EGGS SET AND CHICKENS HATCHED.

When Set.	Description of Eggs.	When Hatched.	No. of Chickens.
March 28..	13 White P. Rock ...	April 18..	2
April 4..	13 " (from Toronto)	" 25..	10
" 9..	13 Barred "	" 30..	8
" 9..	13 White " (from Arnprior. Eggs badly packed and injured)	" 30..	1
" 18..	13 B. Minorca	May 9..	9
" 18..	13 White P. Rock	" 9..	6
" 18..	13 Light Brahma	" 9..	9
" 18..	13 White Minorca	" 9..	9
" 21..	13 White P. Rock	" 12..	9
" 23..	13 Langshan..	" 14..	4
" 25..	13 "	" 16..	5
" 25..	13 Andalusian	" 16..	13
" 25..	13 Indian Game and Java Cross.. ..	" 16 .	8
" 25..	13 White Minorca	" 16..	8
" 26..	13 White Wyandotte (from Guelph)	" 17..	10
" 26..	13 B. Leghorn ..	" 17..	11
May 3..	13 W. Wyandotte (from near the city)	" 24..	5
" 3..	13 B. P. Rock "	" 24..	6
" 5..	13 B. Minorca "	" 24..	7
" 10..	5 " 6 Langshan (from British Columbia)	" 31..	7
" 10..	13 Indian Game (from Rigaud, Que.)	" 31..	2
" 10 .	13 Andalusian	" 31..	3
" 10..	13 S. L. Wyandotte (from Rigaud, Que.)	" 31..	6
" 21..	13 Buff Leghorn (from Chesterville, Ont.)	June 11..	6
" 21..	13 Langshans	" 11..	7
" 21..	15 White Leghorn (from Lindsay)	" 11..	10
" 26..	13 S. L. Wyandotte	" 16..	4
June 16..	10 W. Minorca, 3 Andalusians... .	July 7..	8
	364 About 28 settings of 13. Average result 55 per cent.		193

Some of the small hatches, as shown above, were due to erratic sitters, or from eggs which were much shaken up in transit. As to the results from eggs from outside sources, experience varies. In some cases eggs from a great distance hatch well, while from eggs obtained from a near-by source there may be only two or three chickens. Much depends upon the freshness and fertility of the eggs before being sent, the manner in which the eggs are packed and the handling of the package *en route*. But the rest depends upon the manner in which the eggs are set and the care given to them by the receiver. It will be seen in the above table that 11 eggs from British Columbia

gave 7 chickens, while from 13 eggs from Rigaud, Que., only two chickens were hatched. No eggs could be more carefully packed than were the latter. The number of chicks hatched from the British Columbia eggs, and the vigorous growth made by them, told plainly of robust parent stock and strong germs. All that seems possible to be done under the circumstances, by the breeder, is to have his laying stock in proper condition, well mated, and to send out none but strictly fresh eggs packed carefully. It is for the express companies to transport as safely as possible, and for the consignee to set the eggs under a reliable sitter, as soon as possible after receiving them.

CARE AND SKILL REQUIRED IN OBTAINING EARLY FERTILE EGGS.

If the farmers' hens lay well during the winter months there may be difficulty in obtaining a satisfactory percentage of fertile eggs to put under the early March and April sitters, and from which are expected the early chickens, so desirable. Skill and experience are required in the feeding and handling of the laying stock, so as to have plenty of eggs at the period of high prices and early fertile eggs. Particularly so in cases where the layers are confined to limited quarters from the beginning to end of the winter months. Later on, when the season is warmer and the hens run out there can be no difficulty in having 10, 11 and 12 chicks from 13 eggs, usually put under a sitter, of medium size, at that period. But it is to be borne in mind that for market purposes and early layers, the early chicks are worth much more than those hatched in late May or early June. It should be the aim to have pullets to begin to lay in September and keep on doing so until the yearling and older hens are over their moult and join with them in egg production for the winter. It is worth some effort then to get the early chickens. Experience has shown that hens of the sitting varieties which lay well in winter make early sitters. It is an object then for the farmer, who desires early sitters and who does not use artificial means, to have his hens lay in winter.

FOOD AND GROWTH OF THE CHICKENS.

Experience of many years has proved the necessity of the careful looking after and proper feeding of the chickens from time of hatching. The chickens were allowed to remain in the nest with the mother hen twenty-four hours, or until they were quite strong on their legs. With the mother hen they were then placed in a coop on the grass outside, weather permitting. On the floor of the coop was dry sand to the depth of one or two inches. The coop was so arranged that the chicks could run in or out, while the hen was confined inside. By this method the chicks can be better looked after and more regularly fed. Their rations were placed on a clean board in front, which at night was used to securely fasten up the front part of the coop. The mother hen received her food in the shape of corn or wheat, and water was always within her reach. The first food of the chicks was stale bread crumbs, or stale bread soaked in milk and squeezed dry. Next day granulated oatmeal or rolled oats were added to the bill of fare. No foods have been found better for the newly hatched broods. Later on, crushed corn was added, and still later on whole wheat, in small quantities at first. As the chicks grew, a mash composed of shorts, cornmeal, bran, stale bread and a small quantity of blood meal was substituted for the more dainty and expensive first rations. For drink, milk sweet, or skimmed, sometimes mixed with water was used. The food was given, at first a little and often. Afterwards four or five times per diem. The sand in the coops was regularly renewed, and the latter were, occasionally, sprinkled with coal-oil, so as to prevent the lodgment of lice. Lice on hens or chickens was prevented, as far as possible, by occasionally rubbing the feathers of the former, under wings and breast the wrong way, with a cloth dampened, *not wet*, with coal-oil. Chicks showing signs of lice were dusted with insect powder. Experience has shown that chickens intended for early market, or for early layers, must be carefully looked after from time of hatching. It must be borne in mind that a chicken which has become "stunted" from being "stinted" in the first five weeks of its existence, will never make

a satisfactory fowl for any purpose. It is also to be remembered that chickens which are dragged about by an active mother in her energetic search for food for them, are more likely to develop muscle and sinew than flesh. And their future worth becomes hopeless, when after being left by the mother hen, they are allowed "to pick up their own living as best they can." On taking the mother hen with her brood from the nest it is well to give her food and water. She will then be more likely to brood her chicks quietly and contentedly.

WEIGHT DEVELOPMENT OF THE CHICKS.

With the foregoing food and treatment, but with no more care or attention than a farmer ought and could give his chickens, the following development was made :—

	Lbs.	Oz.
A white Plymouth Rock Cockerel hatched on the 18th April, weighed on 21st October, 6 months and 3 days after....................	7	4
The same bird on 22nd November, 1 month and 1 day later........	8	8
And on 6th December, 14 days later..............................	9	4½
Three other white P. Rocks hatched on the 25th April, weighed on 21st October following, 5 months and 26 days..............	5	14
" " "	5	12
" " "	5	12
A Barred P. Rock Cockerel hatched on 30th April, weighed on the 8th November following, 7 months and 8 days...............	8	6
Same bird on 6th December....................................	9	5
Another B. P. R. Cockerel hatched on same day weighed on 31st October, 6 months after..................................	7	5½
Three other cockerels of same breed hatched on 24th May, weighed on 31st October..	5	13½
" " "	5	6½
" " "	5	3

FOUR SILVER LACED WYANDOTTES.

Hatched 31st May, weighed 31st October..........................	5	5
" "	5	5
" "	4	13
" "	4	8

FOUR LIGHT BRAHMAS.

Hatched 9th May, weighed 31st October, 5 months, 22 days.......	6	12½
" "	6	8½
" "	5	13½
" "	5	7½

TWO INDIAN GAME—W. JAVA CROSSES.

The only cross made was with a White Indian game cock and White Java hens. Two of them made weight as follows :—

Hatched 16th May, weighed 31st October, 5 months 15 days.......	4	10½
" "	4	5½

This cross made finely shaped, plump market fowls, with well rounded breasts and meaty thighs. The flesh seemed white and fine in grain. When fattened, killed, plucked and dressed, but not drawn, the birds presented an unusually inviting appearance.

No. 1.

Dressed White Plymouth Rock Cockerel as prepared for Home Market.

No. 2.

Cockeral White Java and White Indian Game Cross.

No. 3.

No. 3 same as No. 2.—Dressed for English Market—back view.

No. 4.

Front view of same cross.

THE MOULTING PERIOD.

During the moulting period the fowls received the necessary care and attention as fully described in report of 1896. Experience confirms the necessity of looking after the laying stock at this period of non-production, if eggs in November are desired. Any extra care and trouble at this season will be amply repaid by an output of eggs when they are of the highest value. The foods and treatment best calculated to secure an early moult and in the shortest time are subjects that are being earnestly discussed by the leading poultry breeders of Canada and the United States. Early hatched pullets to begin to lay when the older hens are moulting, and so keep up a continuous supply of new laid eggs are the real and most desirable solution of the problem, but they are not always easy to get (except by artificial means) in the colder districts of the Dominion. A farmer may have early setters from hens which have laid all winter and are of a setting breed, but he certainly will not have them from hens which only begin to lay in spring.

WHEN THE PULLETS COMMENCED TO LAY.

The pullets laid in the following order:—

Barred P. Rock pullet,	7th Nov.	Hatched	April.	
Black Minorca	"	5th Dec.	"	9th May.
Brown Leghorn	"	12th "	"	17th "
White Minorca	"	16th "	"	9th "
White P. Rock	"	17th "	"	25th April.

No effort was made to push the pullets, while running at large, beyond receiving regular feeding and good house accommodation. On going into winter quarters they were given rations calculated to stimulate egg production.

BEGINNING OF WINTER LAYING.

The hens went into winter quarters about the second week in November. Winter laying commenced about the first of December, somewhat later than last year.

DISEASES OF POULTRY.

Inquiries were made from time to time and from different parts of the country during the year, as to ailments affecting poultry. In most cases the sickness and fatal termination could be traced to roup in its varied forms. In several cases the symptoms described pointed to overfeeding and its consequence in liver derangement. As pointed out in a previous report the overfeeding of the morning mash and whole grain, with lack of green food, overcrowding, lack of exercise and over age are the most frequent causes of sickness and death.

ARTIFICIAL INCUBATION.

In the early part of the month of April last, a Prairie State Incubator of 100 egg capacity and a brooder were purchased from the Prairie State Manufacturing Company of Homer City, Penn., U.S.A. The incubator is heated by hot air which circulates over and around the eggs and is made hot by a coal oil lamp placed under and to the right side of the egg chamber. A sensitive thermostat over and partly under the egg tray regulates the temperature. Two shallow pans at top of egg chamber may be used for the supply of moisture, if necessary. The eggs are turned by fitting one tray on top of another, withdrawing them from the incubator and turning carefully. Full directions for its proper working accompanied the machine. The incubator was placed in a small office at the end of the main poultry building. The two first attempts to operate the incubator were not successful. In the first instance two chickens were hatched and only one in the second. The first two chickens hatched

in April turned out to be pullets and were early winter layers, one laying its first egg on 7th November, as already noted. On the 3rd of June, the incubator was again filled with 100 eggs of the following description :—

White Leghorns	36
Andalusian	22
Black Minorcas	18
Brown Leghorns	11
Colored Dorking	13
	100

The temperature of the room varied from 64 to 80.

The lowest reading of the thermometer in the egg chamber during the twenty-one days was $102\frac{1}{2}$ and the highest 103.

The eggs were tested twice, and thirty-five clear and doubtful ones removed, leaving 65 eggs with apparently strong and healthy germs.

On the 18th day one of the moisture pans was filled with warm water, the air space in the eggs showing necessity for moisture.

The result of the hatch was 25 chicks, five of which were not as strong as the others.

The eggs which did not hatch were carefully examined, and the great majority of them contained fully developed chicks which had apparently died between the 18th and 20th days. On being transferred to the brooder the chickens made satisfactory progress, with the exception of the weaklings which died at different times.

The results were certainly not very encouraging. But they go to show that further careful experimental trials will have to be made in order that the experience so essential to success can be gained. It would be unfair, if it were possible, to attribute with certainty the lack of better results to machine, or eggs, or operator until that experience is gained that will permit of expert decision. Future trials and careful observation will, no doubt, in time disclose where the shortcoming or fault is. Meanwhile, we know that the artificial hatching and rearing of chickens, ducks, &c., is the source of handsome profit to joint stock companies and private individuals in our own and other countries. The number of inquiries received from time to time as to machines and methods of operation shows that it is rapidly becoming more in vogue, and that a thorough knowledge of modern machines and methods is necessary in the interest of the great number of farmers who are now turning their attention to poultry breeding in all its different phases.

DUCKS AND GEESE.

From 16 duck eggs presented to the farm by Mr. A. Thompson, of Allan's Corners, Que., 7 Pekin and 1 Aylesbury duck were hatched. One Pekin duck died but the others made famous progress. One of the birds hatched on 26th June weighed on 20th October following, 3 months and 20 days, 8 pounds 3 ounces. Another hatched at same time weighed at same date, 7 pounds 1 ounce. The foregoing were drakes. An Aylesbury duck of same age weighed at same time 5 pounds 15 ounces. One wild goose remains, of the four sent 12 years ago to the farm.

STOCK ON HAND.

The stock on hand at present is as follows :—

——	Cocks.	Cockerels.	Hens.	Pullets.
Barred Plymouth Rocks	3	6	20	8
White "	1	9	8	11
Light Brahmas	1	3	4	3
Langshans	....	5	5	12
White Wyandottes	....	4	9	6
Silver Wyandottes	....	4	6	3
Coloured Dorkings	1	....	7	....
White Leghorn	2	4	22	8
Brown "	1	2	2	11
Buff "	....	....	....	2
Black Minorcas	....	9	7	8
White "	2	3	3	6
Adalusians	1	4	7	3
White Indian Game	1	....	....	....
Cornish "	....	....	....	1
White Indian Game-Java Cross	....	2	....	4
White Javas	....	....	3	....
Mixed fowls	....	14	20	....
	13	69	123	86

EXPERIMENTAL FATTENING OF CHICKENS WITHOUT FORCED METHODS.

Of recent date much attention has been directed in Canada to the subject of fattening of chickens—and so improving their condition—by the English and French methods of "cramming," or forcing of food into the crops of the birds by a machine operated in most cases by foot and in many places by hand, and known as a cramming machine. According to this method the fowls or chickens are penned in specially arranged coops, and allowed to eat all they will or can for ten or twelve days, of a ration composed in England, principally of finely ground oats, skim milk and tallow. At the end of the time mentioned experience has shown that the birds do not eat with the same avidity, as they did at first and the crammer is then brought into requisition. The time taken to properly fatten a bird is 21 days, in some cases a week longer. The chickens which are of mixed breeds and of both sexes, are purchased from the English farmers, when three to five months of age by the higglers or fatteners, who place the birds in long rows of coops and in numbers varying from 320 to 1,200, according to size of premises. The rearing of the chickens is the work of the farmer. The fattening is done by the higgler. They are, in the great majority of cases, two distinct occupations and are a source of profit to both first and second parties. It is an object to obtain large chickens which will make heavy weight. Crosses in which Indian Game or Dorking predominate are preferred. But will it pay our farmers to breed crosses, solely for flesh production, while they have within easy reach thoroughbreds which not only make greater and more rapid flesh development, but good winter layers? Our farmers have a winter market of paying prices. With thoroughbred Plymouth Rocks, Wyandottes, &c., they are in a position to cater to the winter market and rear heavy weight chickens in season, for export or home markets. They have actually two strings to their bow. Experience has shown that the barn-yard fowls, or "scrubs," to be found in such numbers on the farms of the country, are neither good for eggs nor flesh production. First crosses of the larger thoroughbreds are certainly better flesh formers, but they must be made every year, or they will degenerate. All things taken into consideration there is every reason for our farmers stocking their barn-yards with those thoroughbreds which Experimental

Farm reports for some years past and the writer on many platforms, in different parts of the country, have named as the best winter layers and the heaviest and most rapid flesh formers. In connection with the foregoing, the following experiment, which was carried out with the view of finding out the relative merits, as flesh formers, of scrubs, first crosses and thoroughbreds, will be of interest. The experiment was commenced on the 1st of November, and continued for five weeks. Special coops with slatted bottoms and fronts and with feeding troughs in front, were erected in an upper compartment of the main poultry building.

The coops were filled with 34 cockerels and 2 pullets of the following description:

8 barn-yard chickens, some showing Barred Plymouth Rock and Wyandotte origin and others Leghorn and Minorca, were purchased from neighbouring farmers.

4 cockerels of first cross between Light Brahma and Buff Cochin. They were purchased from a farmer on the Richmond Road.

4 first crosses of White Indian Game and White Java hens from Experimental Farm poultry department. Two of the number were pullets.

20 thoroughbred cockerels of the following breeds, viz.:

4 Barred Plymouth Rocks, 4 Light Brahmas, 4 Silver-laced Wyandottes, 4 White Plymouth Rocks, 4 White Wyandottes. All from the Experimental Farm.

These were divided in groups of 4 each and the birds were respectively numbered from 1 to 36.

The rations were composed of—

2 parts of finely ground oatmeal,
1 " " barley meal,
1 " ordinarily ground cornmeal,

and were mixed with sweet milk.

The birds were fed at 7 a.m., noon, and 3.30 p.m., each day, with regularity, all the food they could eat. The exact figures of amount fed are given elsewhere.

On the 15th November, 15 days from beginning of experiment, beef suet in the proportion of one ounce to each group of 4 fowls was added to the ground grains ration and fed three times per day.

Water was regularly supplied, as the birds seemed to desire it.

Mica crystal grit was furnished twice during the five weeks.

The birds were weighed on the afternoon of 31st October, placed in their coops and fed their first ration, a light one. The regular feeding of the rations began next morning, 1st November. The nature and progress of the experiment are shown in the following tables.

The first table shows the weight of the birds on 31st October, their progress per week, the gain made by each bird per week, and the total gain at the end of five weeks. The last column shows the loss in weight from end of fifth week, December 6th to December 8th, two days. The birds were then fasted for 36 hours and killed. It should be explained that the original intention was to dispose of the birds at the end of the fifth week, but as circumstances did not permit they were fed for two days longer.

It is to be borne in mind that the birds were allowed to partake of the food in as great quantity as they felt inclined. There was no machine used for the purpose of forced feeding.

TABLE I.

SHOWING weight of birds on 31st October, when put into coops to fatten; the progress made by each bird per week, and total gain made in five weeks by each bird. The last column shows the weights and losses at end of the two extra days.

GROUP 1.—BARN-YARD CHICKENS.

—	Number.	Weight on 31st October. Lbs.	Oz.	Weight on 8th November. Lbs.	Oz.	Weight on 15th November. Lbs.	Oz.	Weight on 22nd November. Lbs.	Oz.	Weight on 29th November. Lbs.	Oz.	Weight on 6th December. Lbs.	Oz.	Gain in 5 Weeks. Lbs.	Oz.	Weight on 8th December. Lbs.	Oz.
	1	5	7	5	13	6	1½	6	4½	6	8	6	9	1	2	6	7½
Gain per bird per week..	......	..	..	..	6	..	4½	..	3	..	3½	..	1	..	..	..	loss 1½
	2	5	7½	5	11½	6	9½	7	..	7	2	7	5½	1	14	7	1½
" " ..	......	..	..	..	4	..	14	..	6½	..	2	..	3½	..	..	..	" 4
	3	4	7	4	14	5	5	5	7	5	7½	5	10	1	3	5	9
" " ..	......	..	..	..	7	..	7	..	2	..	½	..	2½	..	..	..	" 1
	4	3	12	4	5	4	10½	4	13	5	1	5	2½	1	6½	5	4½
" " ..	......	..	..	..	9	..	5½	..	2½	..	4	..	1½	..	..	..	" 2

GROUP 2.—BARN-YARD CHICKENS.

	5	3	10	4	4½	4	11	4	13	5	..	5	3	1	9	5	2
Gain per bird per week..	......	..	..	..	10½	..	6½	..	2	..	3	..	3	..	..	..	loss 1
	6	3	14½	4	10½	4	14	4	12	4	15	5	2	1	3½	5	2½
" " ..	......	..	..	..	12	..	3½	..	2	..	3	..	3	..	..	..	gain ½
	7	3	10½	4	9	4	15½	5	1	5	9½	5	13	2	3½	5	13
" " ..	......	..	..	..	14½	..	6½	..	1½	..	8½	..	4½	..	..	..	..
	8	3	2	3	10	4	½	4	1½	4	4½	4	6½	1	5½	4	6
" " ..	......	..	..	..	8	..	6½	..	1	..	3	..	3	..	..	..	loss ½

GROUP 3.—LIGHT BRAHMAS,—BUFF COCHIN, 1ST CROSS.

	9	6	13	7	8	7	15	8	8½	8	11½	8	13½	2	½	8	13
Gain per bird per week..	.....	..	..	..	11	..	7	..	9½	..	3	..	2	..	..	..	loss ½
	10	6	9½	7	3½	7	11½	8	1½	8	3	8	10½	2	1	8	8
" " ..	......	..	..	..	10	..	8	..	6	..	1½	..	7½	..	..	..	" 2½
	11	5	10	6	7½	6	13½	7	½	7	6½	7	6	1	12	7	5
" " ..	......	..	..	..	13½	..	6	..	3	..	6	..	½	..	..	..	" 1
	12	6	3	7	½	7	3	7	9½	8	5	8	8½	2	5½	8	8
" " ..	......	..	..	..	13½	..	2½	..	6½	..	11½	..	3½	..	..	..	" ½

GROUP 4.—LIGHT BRAHMAS—EXPERIMENTAL FARM.

	13	6	12½	7	3	7	3				Died	on 17th		inst.			
	14	6	8½	6	15½	7	9½	8	3	8	10	8	12½	2	4	8	12
Gain per bird per week..	......	..	..	..	7	..	10	..	9½	..	7	..	2½	..	..	..	loss ½
	15	5	13½	6	..	6	10½	7	7½	7	12½	7	15	2	1½	7	13
" " ..	..	..	..	..	2½	..	10½	..	13	..	5	..	2½	..	..	..	" 2
	16	5	7½	6	½	6	10½	7	8	8	1	8	6½	2	14½	8	4
" " ..	.....	..	..	..	9	..	9½	..	13½	..	9	..	5½	..	..	..	" 2½

TABLE I—*Concluded.*

SHOWING weight of birds on 31st October, when put into coops to fatten, &c.—*Concluded.*

—	Number.	Weight on 31st October.		Weight on 8th November.		Weight on 15th November.		Weight on 22nd November.		Weight on 29th November.		Weight on 6th December.		Gain in 5 Weeks.		Weight on 8th December.	
		Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
GROUP 5.—S. L. WYANDOTTES—EXPERIMENTAL FARM.																	
	17	5	5	5	7	6	..	6	4½	6	12½	6	15¾	1	10¾	6	12
Gain per bird per week..	......	..	..	..	2	..	9	..	4½	..	8	..	3¼	..	..	..	loss 3¾
	18	5	5	5	7	6	1	6	10½	6	13½	7	2½	1	13½	7	..
" " ..	......	..	..	..	2	..	10	..	9½	..	3	..	5	..	..	..	" 2½
	19	4	8	5	..	5	7	5	6½	5	8½	5	12	1	4	5	10½
" " ..	.....	..	..	..	8	..	7	..	½	..	2	..	3½	..	..	..	" 1½
	20	4	13	5	2½	5	14	6	4½	6	7	6	1	1	4	5	14½
" " ..	.....	..	..	..	5½	..	11½	..	6½	..	2½	..	loss 6	..	..	..	" 2½
GROUP 6.—WHITE INDIAN GAME,—W. JAVA CROSS—EXPERIMENTAL FARM.																	
	21	4	10	5	½	5	8	5	9½	5	11	5	15½	1	5½	5	14
Gain per bird per week..	.....	..	..	..	6½	..	7½	..	1½	..	1½	..	4½	..	..	..	loss 1½
	22	4	5½	4	12½	5	6½	5	13	6	2½	6	6	2	½	6	4½
" " ..	......	..	..	..	7	..	10	..	6½	..	5½	..	3½	..	..	..	" 1½
	23	3	15½	4	4	4	12½	4	14½	5	1	5	3½	1	4	5	3
" " ..	......	..	..	..	4½	..	8½	..	2	..	2½	..	2½	..	..	..	" ½
	24	3	11½	4	2½	4	12½	5	1	5	6	5	13	2	1½	5	12½
" " ..	....	..	..	..	7	..	10	..	4½	..	5	..	7	..	..	..	" ½
GROUP 7.—BARRED P. ROCKS—EXPERIMENTAL FARM.																	
	25	7	5½	7	5	7	12	7	12	8	11½	9	½	1	11	9	..
Gain per bird per week..	....	..	..	..	½	..	7	..	..	..	15½	..	5	..	..	..	loss ½
	26	5	6½	5	12	6	3	6	4½	6	11½	7	..	1	9½	7	..
" " ..	......	..	..	..	5½	..	7	..	1½	..	7	..	4½	..	..	..	..
	27	5	13½	5	13½	6	6	6	8	6	15½	6	15½	1	2	6	15
" " ..	.....	..	..	..	..	..	8½	..	2	..	7½	..	..	..	..	..	" ½
	28	5	2½	5	5½	5	12½	6	9	7	½	7	4	2	½	7	3½
" " ..	......	.	..	..	3	..	7	..	11½	..	7½	..	3½	..	..	..	" ½
GROUP 8.—WHITE P. ROCKS—EXPERIMENTAL FARM.																	
	29	5	8	5	9	6	4½	6	15	7	7½	7	9	2	1	7	8½
Gain per bird per week..	.....	..	..	..	1	..	11½	..	10½	..	8½	..	1½	..	..	.	loss ½
	30	5	6½	6	7	7	4½	7	11	8	1	8	1	2	10½	7	14½
" " ..	...	:	..	..	16½	..	13½	..	6½	..	6	.	..	..	..	..	" 2½
	31	6	8	6	6½	6	15½	7	7	7	7	7	11	1	3	7	9
" " ..	......	..	..	..	loss 1½	..	9	..	7½	..	..	..	4	..	..	..	" 2
	32	5	6	5	11½	5	13½	6	5	6	11½	6	11½	1	5½	6	10½
" " ..	......	..	..	..	5½	..	2	..	7½	..	6½	..	..	..	..	..	" 1
GROUP 9.—WHITE WYANDOTTES—EXPERIMENTAL FARM.																	
	33	5	2	5	9½	6	2½	6	8½	6	13	6	12½	1	10½	6	10
Gain per bird per week..	......	..	..	..	7½	..	9	..	6	..	4½	..	loss ½	..	..	..	loss 2½
	34	3	12	4	2	4	6	4	9	4	9½	4	7½	..	11½	4	4
" " ..	....	..	..	..	6	..	4	..	3	..	½	..	loss 2	..	..	..	" 3½
	35	3	4	3	8	4	2½	5	..	5	6	6	7	3	3	6	9½
" " ..	.....	..	..	..	4	..	10½	..	13½	..	6	..	17	..	..	..	" 2½
	36	5	5	5	11	6	6	6	9½	7	..	7	..	1	11	6	15
" " ..	.....	..	..	..	6	..	11	..	3½	..	6½	..	..	..	..	..	" 1

On the 17th November, No. 13 Light Brahma Cockerel died. On being examined the liver was found deep in colour and highly gorged with blood. There was an accumulation of 3 ounces of fat around the gizzard. The organs and body were otherwise healthy. There was no apparent cause of death.

Nos. 20 S. L. Wyandotte and 34 White Wyandotte were not in good condition for a portion of the time. They did not eat well and lost in weight.

TABLE II.

THE following table shows the gain in weight and quantity of food consumed by the nine groups during five weeks and two days. The last two days show a loss in weight which indicates that after a certain time there is little or no progress by their eating at will :—

——	Gain 1st week.		Food Consumed.		Gain 2nd week.		Food Consumed.		Gain 3rd week.		Food Consumed.		Gain 4th week.		Food Consumed.		Gain 5th week.		Food Consumed.		Last 2 days.		Food Consumed.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Group 1	1	10	9	14½	1	15	9	..	..	14	7	13	..	10	5	7¾	..	8½	4	13½	..	loss 8½	1	6
" 2	2	13	9	10½	1	7	9	..	..	2½	7	5½	1	1½	4	15¼	..	13½	5	1½	..	" 1	1	5
" 3	3	½	10	1½	1	7½	9	..	1	7	8	..	1	10	6	3½	..	12	6	2¾	..	" 4½	1	9½
" 4 (3 fowls)	1	2½	10	1½	1	14	9	..	2	4	8	..	1	9	6	..	..	10½	6	2½	..	" 5	1	7½
" 5	1	1½	10	1½	2	5½	9	..	1	3½	7	8½	..	15½	5	9¼	..	5¾	5	10	..	" 10¼	1	6
" 6	1	9	10	..	2	4	9	..	..	14½	8	..	..	14½	6	4¼	1	1½	5	3½	..	" 4	1	5½
" 7	..	7½	10	1½	1	13½	9	..	..	15	7	11½	2	5½	6	5	..	13	3	15½	..	" 1½	1	9½
" 8	1	4	10	1½	2	4	9	2	2	..	8	..	1	5	5	7¾	..	5½	6	5½	..	" 6	1	11
" 9	1	7½	10	½	3	2½	8	14	1	10	7	6½	1	1½	5	3¾	..	12	4	12	..	" 4½	1	5½

TABLE III.

SHOWING daily and weekly amount of food consumed by each group from afternoon of 31st October, when first ration was fed, to 7th December.

——	Group 1.		Group 2.		Group 3.		Group 4.		Group 5.		Group 6.		Group 7.		Group 8.		Group 9.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
October 31	..	12	..	14	..	15	..	15	..	15	..	13½	..	15	..	15	..	15
November 1	1	..	1	..	1	..	1	..	1	..	1	..	1	..	1	..	1	..
" 2	1	4½	1	4½	1	4½	1	4½	1	4½	1	4½	1	4½	1	4½	1	4½
" 3	1	8	1	4	1	8	1	8	1	8	1	8	1	8	1	8	1	8
" 4	1	8	1	8	1	8	1	8	1	8	1	8	1	8	1	8	1	7
" 5	1	6	1	4	1	6	1	6	1	6	1	6	1	6	1	6	1	6
" 6	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
" 7	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6
Total for the week	9	14½	9	10½	10	1½	10	1½	10	1½	10	..	10	1½	10	1½	10	½
November 8	1	8	1	8	1	8	1	8	1	8	1	8	1	8	1	10	1	6
" 9	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
" 10	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
" 11	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6
" 12	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6
" 13	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6	1	6
" 14	..	14	..	14	..	14	..	14	..	14	..	14	..	14	..	14	..	14
Total for the week	9	..	9	..	9	..	9	..	9	..	9	..	9	..	9	2	8	14

Beginning with November 14th, each group received 3 oz. per day, ¾ oz. to each fowl, of beef suet unrendered, cut fine and passed through a meal cutter, ¼ oz. to each fowl at each meal.

—	Group 1.		Group 2.		Group 3.		Group 4.		Group 5.		Group 6.		Group 7.		Group 8.		Group 9.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
November 15	1	4	..	13½	1	4	1	4	..	13½	1	4	..	15½	1	4	..	17½
" 16	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
" 17	..	13	..	14	1	..	1	..	1	..	1	..	1	..	1	..	..	13
" 18	1	4	1	2	1	4	1	4	1	4	1	4	1	4	1	4	1	4
" 19	1	..	1	..	1	..	1	..	1	..	1	..	1	..	1	..	..	12
" 20	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
" 21	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
Total for the week	7	13	7	5½	8	..	8	..	7	8½	8	..	7	11½	8	..	7	6½
November 22	1	2	..	10	1	2	1	2	1	2	1	2	1	2	1	2	..	12
" 23	1	..	..	12	1	..	1	..	1	..	1	..	1	..	1	..	..	12
" 24	..	13	..	12½	..	14½	1	½	..	11½	..	12¾	..	10½	..	13¾	..	15
" 25	..	8¾	..	8¾	..	8¾	..	9¼	..	9¾	..	18¾	..	15¾	..	12½	..	9½
" 26	..	5½	..	8½	..	10¼	..	6¼	..	4	..	7½	1	..	..	3	..	11¼
" 27	..	13	..	13½	1	..	1	½	1	½	1	½	1	..	1	1½	..	14½
" 28	..	15½	..	14	1	..	..	14	..	13½	..	11	..	8¾	..	7	..	9½
Total for the week	5	7¾	4	15¼	6	3½	6	..	5	9¼	6	4½	6	5	5	7¾	5	3¾
November 29	..	5¼	..	13	..	14½	..	14½	..	14	..	11½	1	3	..	14¼	1	8
" 30	..	14¼	..	15	..	14¾	1	4¼	..	15¾	..	15½	1	½	1	3	..	14½
December 1	..	12¼	1	¼	1	¼	..	14½	..	13¾	..	4¾	..	13½	..	15¾	..	12½
" 2	..	11¼	..	9¼	..	12¼	..	11¾	..	10	..	9¼	..	10½	..	11	..	10
" 3	..	12	..	9	1	½	..	15½	..	14½	..	13	..	12½	..	14½	..	12½
" 4	..	11	..	8	..	10½	..	9	..	10	..	14½	..	12½	..	13	..	8½
" 5	..	11½	..	11	..	14	..	13	..	12	..	15	..	11	..	14	..	10
Total for the week	4	13½	5	1½	6	2¾	6	2½	5	10	5	3½	3	15½	6	5½	4	12
December 6	..	10½	..	11	..	11½	..	10½	..	10	..	9½	..	10½	..	11½	..	10½
" 7	..	11½	..	10	..	14	..	13	..	12	..	12	..	15	..	15½	..	12
Total	1	6	1	5	1	9½	1	7½	1	6	1	5½	1	9½	1	11	1	5½

RESULTS AFTER THE FASTING, KILLING, PLUCKING AND COOKING.

As already stated, the birds were fed their last ration on the afternoon of December 7th. They were given no food for 36 hours previous to being killed, in order to secure complete emptiness of crops and intestines. This is a matter of great import. If crops or intestines contain any food after death it is likely to decompose and ruin the carcass. It is an imperative condition, in the preparing of poultry for shipment to Great Britain, that the birds be fasted for 24 to 36 hours previous to killing. Experience has shown that 36 hours is the better margin. The birds were killed by dislocation of the neck. The easiest manner of killing and causing instantaneous death. The birds were immediately plucked. The plucking of the bird can be much more expeditiously and perfectly done while the body of the fowl is warm. The birds were carefully dry picked. Care was taken to avoid any abrasions of the skin, which is apt to occur with careless handling. The scalding of the birds, in order to permit of easy picking, should be avoided in any case, but it ruins the birds for sale in the English market. After plucking, the birds were placed in a small trough made by nailing a board to the wall of the loft of the poultry house at an angle of 45 degrees. The birds were allowed to remain in this trough until cool. Meanwhile they had assumed a round and compact shape, which added much to their appearance. The birds were then packed into cases to be sent to cold storage, with the exception of 9 which were retained for further

experiment. The birds chosen were composed of one from each group and were fairly representative ones, but by no means the best. The following table shows the loss in weight occasioned by 36 hours fasting, plucking and the waste in dressing and boiling:—

TABLE IV.

SHOWING loss in weight from fasting, plucking, dressing and boiling.

—	Weight. Lbs. Oz.	After fasting 36 hours. Lbs. Oz.	After plucking. Lbs. Oz.	Weight of entrails. Oz.	Weight of waste, head, feet, &c. Lbs. Oz.	After dressing. Lbs. Oz.	Weight of giblets. Oz.	Weight of fat. Oz.	After boiling 1¼ hours. Lbs. Oz.	Weight of flesh. Lbs. Oz.	Weight of bone. Oz.	Weight of extractive. Lbs. Oz.
Group 1.												
No. 1	6 7½	....	6 ½	6½	.. 13¾	4 1	3¾	8½	....	2 12¼	10½	3¾
" 2	7 1½	....	6 9½	....	....	....	....	....	....	....	....	....
" 3	5 9½	....	5 2	....	....	....	....	....	....	....	....	....
" 4	5 4½	....	4 9¾	....	....	....	....	....	....	....	....	....
Group 2.												
No. 5	5 2	....	4 8½	....	....	....	....	....	....	....	....	....
" 6	5 2½	....	4 9	7	.. 11¼	3 1½	3¾	2	....	2 7	8	3
" 7	5 13	....	5 5½	....	....	....	....	....	....	....	....	....
" 8	4 6	....	3 14½	....	....	....	....	....	....	....	....	....
Group 3.												
No. 9	8 13	....	8 2	....	....	....	....	....	....	....	....	....
" 10	8 8	....	7 15½	8	1 4½	5 7	5	5¼	....	3 6½	13	5
" 11	7 5	....	6 11	....	....	....	....	....	....	....	....	....
" 12	8 8½	....	7 14	....	....	....	....	....	....	....	....	....
Group 4.												
No. 13	dead.	....	....	....	....	....	....	....	....	....	....	....
" 14	8 12	8 8½	7 14	....	....	....	....	....	....	....	....	....
" 15	7 13	7 10	7 ..	7¾	1 3¾	4 8½	5½	5	....	3 2¼	11¼	4½
" 16	8 4	8 1	7 8½	....	....	....	....	....	....	....	....	....
Group 5.												
No. 17	6 12	6 9½	6 2	....	....	....	....	....	....	....	....	....
" 18	7 ..	6 13½	6 7½	....	....	....	....	....	....	....	....	....
" 19	5 10½	5 8½	5 1½	6	.. 12¼	3 7½	4	3¾	....	2 6¾	9¾	4
" 20	5 14½	5 11	5 4	....	....	....	....	....	....	....	....	....
Group 6.												
No. 21	5 14	5 12½	5 8	6¾	.. 10½	3 12½	3¾	6¾	....	2 ..	7½	3
" 22	6 4½	6 2	5 13½	....	....	....	....	....	....	....	....	....
" 23	5 3	5 1	4 12½	....	....	....	....	....	....	....	....	....
" 24	5 12½	5 10½	5 7	....	....	....	....	....	....	....	....	....
Group 7.												
No. 25	9 ..	8 13½	8 7½	....	....	....	....	....	....	....	....	....
" 26	7 ..	6 14	6 7	8¾	.. 15¾	4 7¾	4½	2¼	....	2 13¾	11½	5¾
" 27	6 15	6 12	6 4½	....	....	....	....	....	....	....	....	....
" 28	7 3½	7 2	6 10	....	....	....	....	....	....	....	....	....
Group 8.												
No. 29	7 8½	7 6	7 ½	....	....	....	....	....	....	....	....	....
" 30	7 14½	7 11	7 3½	....	....	....	....	....	....	....	....	....
" 31	7 9	7 6	6 14	8	1 2	4 10¾	5½	3½	....	3 1	10½	5
" 32	6 10½	6 8½	6 ½	....	....	....	....	....	....	....	....	....
Group 9.												
No. 33	6 10	6 8	6 1	8	.. 12¾	4 1¾	5	4½	....	2 12	12¼	4¼
" 34	4 4	4 3	3 12½	....	....	....	....	....	....	....	....	....
" 35	6 9½	5 5½	5 ..	....	....	....	....	....	....	....	....	....
" 36	6 15	6 12½	6 3½	....	....	....	....	....	....	....	....	....

View on the Experimental Farm at Nappan, Nova Scotia, showing Garden and part of Experimental Plots.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., 30th November, 1898.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the following report of the operations on the Experimental Farm for the Maritime Provinces, at Nappan, N.S., during the year 1898.

WEATHER.

December, 1897, came in cold with severe frost on the 3rd, followed by open weather to the 17th, when it set in cold again, remaining so until the 27th, which was moderate. The mercury fell to 2° below zero on the 30th. The first of January was more moderate, but the temperature fell to 4° below zero on the 3rd; and 3, 10 and 3 degrees below zero on the 4th, 5th and 6th respectively. The 7th and 8th was again soft weather, the mercury falling and keeping from 2° to 10° above zero as a minimum temperature until the 18th; when the thermometer registered 23° below zero; on the 19th, 22°; on the 22nd, 8°; on the 23rd, 7°; on the 26th, 5°; on the 27th, 0°; on the 28th, 8°; on the 29th, 23°; on the 30th, 24°; and the temperature fell to 30 degrees below zero on the 31st.

Slight snow fell on the 3rd of January and sleighs were used in some places; but sleighing was not good until the 13th, when there was quite a fall of snow, and on the 21st we had a heavy storm with wind, followed by a more severe one on the 24th. The first of February was still cold with a snow storm on the 1st and a very heavy one again on the 3rd. On the 4th of February, the mercury registered 17° below zero, but did not fall to zero again after that time. The weather was milder on the 6th and continued so until the 12th. The remainder of the month was pleasant with some quite severe frosts.

March was quite a moderate month being somewhat broken with snow and wind storms until the middle of the month. On the 30th there was a heavy rain; with a strong wind and another rain storm on the 31st and snow and rain again on April 1st. April was fine after this until the 15th and 16th, which days were wet; then it was again fine until the 21st, on the 25th it rained and on the 26th it snowed all day, but rained again on the 27th, the weather remaining cloudy and dull until May the 3rd, after this fine weather prevailed until the 14th, when there was a heavy warm rain. No heavy rain occurred again until the last of May and first of June.

On the 13th of April, the first grain was sown on a dry part of the farm, on the 23rd a small plot of barley was sown, but no further seed was sown until the 5th of May. Seeding then continued uninterrupted from the 9th to the 14th and from the 21st to 29th. The month of June was somewhat colder than usual being only fair growing weather and having little rain until the latter part of the month. July came in fine and warm and good growing weather continued.

The first hay was cut 1st July, and two weeks of excellent haying weather followed, after which the season was broken. The last of the English hay was gathered by 10th

August, and on the 30th broad leaf haying was finished. Winter Rye was cut 2nd August, and the first spring sown grain was cut 6th August. After the middle of August there was a week of splendid weather, with broken weather again until September.

The first frost occurred on the 13th September, it did not, however, fall below 31°, yet this injured some of the grain plots.

September was an exceptionally fine month until the 23rd, when it became wet and continued dark with almost continuous rains, not often heavy, until the 25th of November, when the first severe frost occurred. On the 11th of November there was a slight fall of snow, followed with rain, and a very heavy wind and snow storm on the 27th, the remainder of the month continued wet.

The fall has been exceptionally open having no heavy frosts. The thermometer registered the lowest temperature for September, 31° on the 22nd and 26° on the 25th; for October 26° on the 7th; 28° on the 10th; 24° on the 11th; 32° on 14th and 24° on the 29th; for November 31° on the 2nd; 28° on the 4th; 29° on the 8th and 31° on the 10th.

Maximum and minimum thermometer readings for the year beginning with 1st December, 1897, and ending with 30th November, 1898.

Temperatures.

Month.	Maximum.	Minimum.
1897.		
December	56° above zero on 16th	2° below zero on 30th
1898.		
January	41° " 8th	30° " 31st
February	45° " 13th	17° " 4th
March	54° " 30th	3° above zero on 3rd
April	62° " 13th	20° " 11th
May	75° " 27th	24° " 10th
June	78° " 26th	33° " 18th
July	88° " 28th	40° " 6th
August	79° " 4th	42° " 29th
September	80° " 6th	26° " 25th
October	77° " 4th	24° " 11th
November	50° " 25th	21° " 27th

HAY.

The hay crop on the marsh was a good average yield, while the upland was over an average crop. The 35 acres of marsh, growing English hay, produced 81 tons 1,000 pounds and the 6 acres of broad leaf marsh 10 tons 400 pounds. Thirteen acres of upland yielded 38 tons 1,600 pounds making total of 130½ tons. Considerable rain during hay making time made the haying season long; the hay was, however, gathered in good condition.

EXPERIMENTS WITH OATS.

The land on which the oat plots were sown was a light clay loam. It was mudded in the winter with 60 two-horse loads of marsh mud per acre. Complete fertilizer at the rate of one barrel per acre was drilled in with the seed. This land was previously devoted principally to grain crops and was very poor and weedy, never having had any barn-yard manure. Mammoth Red Clover, 10 lbs. per acre was sown with the grain, but made only poor growth.

Sixty-four varieties were sown in one-twentieth acre plots on the 11th and 12th of May. There was some smut in the grain, the varieties named King and Dawson suffering more than the others. Most of the grain was slightly rusted. The following results were obtained :—

OATS—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw Per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs
Thousand Dollar	Aug. 16	97	32	Stiff	7	Branching	3,300	50	..	34
Cream Egyptian	" 15	96	32	"	6	Sided	3,500	48	8	37
Abundance	" 17	98	30	"	6	Branching	3,480	48	8	33
Columbus	" 17	98	32	Medium	6	"	3,240	48	8	33
Lincoln	" 17	98	30	Stiff	6	"	3,440	48	8	34
Prize Cluster	" 13	94	36	"	7	"	3,460	47	22	37½
Oderbruch	" 19	100	30	"	6	Sided	3,300	47	2	37
Abyssinia	" 15	96	32	"	7	"	3,660	45	30	37
White Schonen	" 19	100	36	"	7	Branching	3,540	45	10	34
Banner	" 19	100	30	"	6	"	3,100	44	24	34
Bavarian	" 19	100	32	"	6½	"	3,040	44	24	33
White Russian	" 17	98	32	"	6	"	3,500	44	24	34
Early Blossom	" 20	100	28	"	5	Sided	3,000	43	18	37
Doncaster Prize	" 17	98	30	"	7	Branching	3,320	42	32	36⅓
Black Mesdag	" 16	97	30	Medium	7	"	2,540	42	32	34⅓
Victoria Prize	" 15	96	33	Stiff	9	"	3,560	42	12	37
White Giant	" 19	100	31	"	6½	"	4,100	42	12	33
Siberian O. A. C	" 20	101	32	"	8	"	2,600	42	12	33
Mennonite	" 16	97	32	"	7	"	2,840	42	12	34
Flying Scotchman	" 13	94	36	"	7	"	3,100	41	6	38
Rennie's Prize White	" 13	94	32	"	8	"	3,160	40	..	40½
Wide Awake	" 19	100	30	"	6	"	2,200	40	..	34
Early Maine	" 16	97	27	"	7	"	3,140	40	..	35
Golden Giant	" 22	103	30	"	6	Sided	2,100	40	..	34
American Beauty	" 19	100	32	"	5	Branching	2,540	40	..	32
Danish Island	" 19	100	30	"	6	"	2,300	39	14	33
White Wonder	" 15	96	34	"	8	"	3,460	38	28	37
California Prolific Black	" 17	98	30	"	7	Sided	3,100	38	28	32
Hazlett's Seizure	" 16	97	30	"	7	Branching	2,700	38	28	38
Wallis	" 19	100	30	"	7	"	2,200	38	28	34
Imported Irish	" 13	94	32	"	8	"	2,800	38	8	40
Prolific Black Tartarian	" 15	96	32	"	7	Sided	3,600	36	16	33
Poland	" 13	94	32	"	7	Branching	2,600	35	30	38
Golden Tartarian	" 24	105	30	"	6	Sided	2,140	35	30	32
Early Golden Prolific	" 19	100	30	"	6	Branching	2,040	35	10	34
Welcome	" 17	98	32	"	7	"	2,000	35	10	37
Scottish Chief	" 19	100	33	Medium	6	"	2,300	35	10	37½
Golden Beauty	" 20	101	30	Stiff	7	"	2,700	35	10	33
Mortgage Lifter	" 16	97	32	"	8	"	1,900	34	4	37
Early Archangel	" 17	98	31	"	6½	"	2,200	34	4	37
Newmarket	" 17	98	30	"	6	"	1,760	34	4	34
Master	" 20	101	30	"	7	"	2,760	33	18	36
Rosedale	" 17	98	30	"	6	Sided	1,800	33	18	37
Early Gothland	" 19	100	30	"	6	"	2,260	33	18	37½
Bonanza	" 19	100	31	Medium	7	Branching	2,100	32	32	35
Cromwell	" 22	103	28	"	6	"	1,840	32	12	35
Buckbee's Illinois	" 24	105	28	Stiff	5	"	1,840	31	26	35
King	" 19	100	28	"	5	"	2,140	31	26	35
American Triumph	" 20	101	34	"	7	"	1,880	31	26	34
Improved American	" 19	100	30	"	5	"	1,840	31	6	33
Joanette	" 16	97	28	Medium	6	"	2,000	30	20	35
Brandon	" 22	103	30	"	7	"	1,740	30	20	35
Dawson	" 19	100	30	"	8	"	1,800	29	14	38
Holland	" 22	103	26	Stiff	6	Sided	1,880	28	8	34
Miller	" 19	100	28	"	6	Branching	1,960	28	8	34
Russell	" 22	103	28	Medium	6	"	2,100	28	8	35
Olive	" 16	97	28	Stiff	6	Sided	1,800	27	22	36

OATS—TEST OF VARIETIES.—*Concluded.*

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs
Holstein Prolific	Aug 20	101	26	Stiff	5	Branching	1,680	27	22	34
Coulommiers	" 24	105	28	"	6	"	1,860	27	22	33
Medal	" 20	101	26	Medium	6	"	1,960	26	16	35
Improved Ligowo	" 16	97	30	Stiff	7	"	1,700	25	10	33
Oxford	" 20	101	26	"	6	"	1,740	24	4	36
Winter Grey	" 16	97	30	Medium	7	"	1,700	22	12	37
Pense	" 20	101	26	Stiff	5	Sided	1,560	22	12	36

NOTE.—The weights given here, and also in all other grain tables in this report, were taken as the grain came from the threshing mill, and are not the maximum weights that the grain could be brought to by cleaning.

TREATING OATS TO PREVENT SMUT.

In order to test the relative value of different materials for treating seed oats to prevent smut, experiments were tried in accordance with instructions received from the Director, with three different kinds of oats, which were tested as follows:

1st. Bordeaux mixture made with 4 lbs. of sulphate of copper to 4 lbs. of lime, in a 40 gallon barrel full of water in which the seed was soaked for four hours.

2nd. Formalin 2 parts in one thousand made by mixing 3 oz. of formalin in 10 imperial gallons of water in which the seed was soaked for two hours.

3rd. Formalin 3 parts in one thousand made by mixing 4½ oz. of formalin in 10 imperial gallons of water in which the seed was soaked for two hours.

After the grain had been soaked for the periods named it was taken out of the solution, where it had been suspended in a bag, and drained for a short time after which it was exposed to the air and dried before sowing. A fourth plot of each variety was not treated but left as a check plot. The seed was sown in plots measuring 33 by 3 feet on 13th May, and a record of the smutty heads and those free from smut was taken 20th August. The following results were obtained.

OATS TREATED FOR SMUT.

Varieties and how treated.	Good Heads.	Smutty Heads.
Doncaster Prize.		
Bordeaux Mixture	3,450	30
Formalin, 2 parts in 1,000	3,066	......
" 3 "	4,014	36
Untreated	2,550	156
Mortgage Lifter.		
Bordeaux Mixture	2,646	6
Formalin, 2 parts in 1,000	2,658	......
" 3 "	3,048	......
Untreated	3,354	126
Flying Scotchman.		
Bordeaux Mixture	2,514	30
Formalin, 2 parts in 1,000	3,402	......
" 3 "	2,814	......
Untreated	3,192	132

EXPERIMENTS WITH BARLEY.

The test plots of barley consisted of 24 varieties of six-rowed and 17 varieties of two-rowed. The soil on which they were grown was a clay loam which had roots as a previous crop. One barrel of complete fertilizer was used per acre. The fertilizer was drilled in with the seed. The "Wisner" seed drill with fertilizer attachment was used for sowing all grain plots.

Some of the varieties had smut in them; but the straw was free from rust. Ten pounds of clover, the Mammoth Red variety per acre was sown with the grain and made a splendid growth; having quite a sward to turn down late in the autumn. The seed was sown 10th May in one-fortieth acre plots at the rate of two bushels per acre. The results obtained are given in the following table:—

Barley, Six-rowed—Test of Varieties.

Name of Variety.	Date of Ripening,	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per acre.	Yield per acre.		Weight per Bushel.
			In.		Inches.	Lbs.	Bus.	Lbs.	Lbs.
Pioneer	Aug. 9	91	42	Stiff	3	3,800	50	..	51
Stella	" 15	97	40	"	2¾	4,080	46	32	49
Oderbruch	" 8	90	34	Medium	2½	4,200	45	40	50
Baxter	" 6	88	38	"	2½	4,200	41	32	49
Odessa	" 8	90	36	"	2¼	3,640	40	40	48
Trooper	" 9	91	34	Stiff	2½	3,000	40	40	48
Vanguard	" 8	90	34	Medium	2¼	3,240	38	16	49
Common	" 8	90	34	"	2¼	3,200	37	24	49
Mensury	" 6	88	36	Stiff	2½	3,600	37	24	48
Success	" 6	88	36	"	2½	4,200	36	32	41½
Summit	" 15	97	46	"	3	4,040	36	32	48½
Rennie's Improved	" 8	90	36	"	2½	4,000	34	8	48
Nugent	" 9	91	32	"	2½	3,660	34	8	48
Phœnix	" 9	91	35	"	2½	3,400	34	8	49
Empire	" 12	94	38	"	2¾	3,200	34	8	48
Excelsior	" 6	88	38	"	2½	3,720	33	16	40
Blue Barley	" 9	91	35	"	2½	3,400	33	16	41
Mansfield	" 11	93	38	"	2¼	3,480	33	16	46
Royal	" 8	90	36	"	2¼	3,400	33	16	48
Argyle	" 9	91	38	"	2½	3,400	32	24	47
Petschora	" 9	91	34	Medium	3	2,880	29	8	45½
Surprise	" 15	97	37	Stiff	2½	3,200	29	8	48
Champion	" 6	88	36	"	2½	3,080	25		41

Barley, Two-rowed—Test of Varieties.

Name of Variety.	Date of Ripening,	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per acre.	Yield per acre.		Weight per Bushel.
Beaver	Aug. 12	93	34	Stiff	3½	2,800	40	40	49½
Bolton	" 12	93	34	"	3	2,600	35	..	51
Newton	" 12	93	34	"	2½	3,500	33	16	48
Danish Chevalier	" 15	96	32	Medium	3½	3,600	33	16	47½
Dunham	" 12	93	38	Stiff	3	2,920	32	24	47½
Sidney	" 15	96	34	"	3	2,680	32	24	50
French Chevalier	" 15	96	35	Medium	3½	3,400	30	..	48
Victor	" 12	93	37	Stiff	3	2,920	29	8	50½
Nepean	" 12	93	35	Medium	2¼	3,080	28	16	49
Canadian Thorpe	" 12	93	34	Stiff	3	2,920	27	24	49½
Prize Prolific	" 15	96	32	"	4	3,000	27	24	47
Leslie	" 12	93	36	"	2½	2,600	26	32	49
Pacer	" 12	93	36	"	2½	2,680	25	40	48½
Logan	" 12	93	38	"	3	2,840	25	40	48
Kinver Chevalier	" 15	96	35	Medium	3½	3,200	25	40	47
Monck	" 15	96	34	Stiff	3	3,240	25	..	49
Thanet	" 15	96	32	"	3	2,440	24	8	48½

EXPERIMENTS WITH SPRING WHEAT.

Forty-two varieties of spring wheat were sown in these experimental plots. The straw rusted very badly and consequently the grain did not fill out, the crop being almost a complete failure in some cases. The soil on which these wheats were grown, was a clay loam, similar to that on which the barleys were grown and received the same treatment.

The plots were one-fortieth acre each. The seed was sown 9th May at the rate of 1¾ bushels per acre. Mammoth red clover at the rate of 10 pounds per acre was sown at the same time with the grain. The clover made vigorous growth and quite a heavy crop was consequently turned under when ploughed in the autumn. The results obtained were as given below:—

Spring Wheat—Test of Varieties.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per acre.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	lbs.	Lbs.
Wellman's Fife	Aug.	24	107	37	Stiff	3	Beardless	2,560	25	20	57
Pringle's Champlain	"	18	101	34	"	2½	Bearded	3,800	24	40	58
Beauty	"	23	106	34	"	2½	Beardless	2,280	23	20	55
Progress	"	19	102	34	"	3	"	3,000	22	40	57
Alpha	"	22	105	38	"	2½	"	2,800	22	40	58
Admiral	"	22	105	34	"	2½	"	2,400	22	..	58
Hungarian	"	23	106	36	"	2½	Bearded	2,600	22	..	58
White Connell	"	23	106	36	"	2½	Beardless	2,520	22	..	56
Emporium	"	23	106	36	"	2½	Bearded	2,800	21	20	57
Huron	"	23	106	38	"	3	"	2,600	21	20	55
Countess	"	19	102	35	"	2½	Beardless	3,400	20	40	55½
Colorado	"	18	101	36	"	2½	Bearded	3,800	20	40	57
Rio Grande	"	24	107	38	"	3½	"	2,880	20	..	57
Monarch	"	25	108	38	"	3½	Beardless	2,680	20	..	56½
Herisson Bearded	"	19	102	32	Weak	1½	Bearded	2,360	20	..	58½
Blenheim	"	23	106	38	Stiff	3	"	3,800	20	..	56½
Red Fife	"	23	106	36	"	2½	Beardless	2,120	19	20	56
Beaudry	"	19	102	37	Medium	2½	Bearded	2,800	19	20	56½
Rideau	"	19	102	32	"	2¼	Beardless	2,600	18	40	55
Harold	"	19	102	33	Weak	2	Bearded	2,240	18	40	57
Plumper	"	19	102	33	Medium	2¾	"	2,720	18	40	55
Old Red River	"	24	104	32	Stiff	2½	Beardless	2,560	18	40	56
Captor	"	23	106	36	"	2	"	2,280	18	..	56
Red Fern	"	18	101	36	"	2¾	Bearded	2,360	18	..	57
Preston	"	18	101	37	"	3	"	2,200	17	20	56
Goose	"	19	102	34	Medium	2¼	"	2,800	17	20	59
Percy	"	22	105	38	Stiff	2½	Beardless	2,400	17	20	57
Vernon	"	19	102	35	"	2¼	Bearded	2,600	17	20	52
Advance	"	24	107	36	"	3	"	2,600	17	20	55
Stanley	"	24	107	36	"	3	Beardless	2,600	17	20	55
White Fife	"	22	105	36	"	3	"	2,380	17	20	55
Dufferin	"	18	101	39	"	2½	Bearded	2,600	16	40	56½
Golden Drop	"	18	101	32	"	2½	Beardless	2,200	16	..	52
Campbell's White Chaff	"	19	102	36	"	2¼	"	3,680	16	..	52
Crown	"	24	107	34	"	2¾	Bearded	1,920	16	..	54½
Ladoga	"	18	101	40	"	3	"	3,800	15	20	53
Blair	"	19	102	37	Medium	2½	Beardless	2,840	15	20	56
Dion's	"	22	105	35	Stiff	3	Bearded	2,320	15	20	55
Black Sea	"	18	101	38	"	3	"	2,680	14	40	52
Dawn	"	18	101	36	"	3	Beardless	1,800	14	00	54
White Russian	"	19	102	33	"	2¼	"	2,200	13	20	50
Mason	"	19	102	33	Medium	2½	"	1,920	12	40	54

EXPERIMENTS WITH PEASE.

Forty-seven varieties of pease were sown on land similar to that on which the oats were grown. No mud was applied, but complete fertilizer at the rate of one barrel per acre was used. This land was very poor, never having had any barn-yard manure. Soon after the plots were sown, a weed called "spurry" *Spergula arvensis L.* came up so thickly that it completely choked the growth of the pease so that it was thought advisable to cut many of them for green fodder. Under the circumstances no comparative report can be given which would be of any value as to the relative merits of the varieties tested.

RESULTS OF EARLY MEDIUM AND LATE SOWINGS.

The sowing of grain at different periods to test the relative value of early, medium, and late sowings was again carried on this year. The first set of these plots was sown 5th May and continued until 9th June, one set each week, making six sowings in all, one week apart. Two varieties each of wheat, barley, oats and pease were used in this test.

The soil was a clay loam of poor quality. Pease had been grown on the land for the two previous years. This season it was worked up with the disc harrow and stable manure at the rate of twenty 30 bushel cart loads per acre was applied and worked in. The seed was then sown, and one barrel of complete fertilizer per acre was applied at the same time. The last set of wheat plots were injured by frost on 13th September. The early wheat plots were more rusted than the later ones. The oats were slightly rusted and the barley had a considerable quantity of smut in it. The plots were one-fortieth of an acre each. The results obtained were as follows:—

OATS—RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing	Weight of Straw per acre.	Yield per Acre.		Weight per Bushel.
				Lbs.	Bush.	Lbs.	Lbs.
No. 1—Banner	May 5	Aug. 15	102	3,400	52	32	32
Abundance	" 5	" 15	102	2,840	50	20	32
No. 2—Banner	" 12	" 20	100	3,480	48	8	33
Abundance	" 12	" 20	100	2,920	48	8	32
No. 3—Banner	" 19	" 27	100	3,280	48	8	33
Abundance	" 19	" 27	100	2,520	36	16	32
No. 4—Banner	" 26	" 31	97	2,840	41	26	32
Abundance	" 26	" 31	97	2,400	32	32	31
No. 5—Banner	June 2	Sept. 6	96	2,800	36	16	32
Abundance	" 2	" 6	96	3,200	43	18	29
No. 6—Banner	" 9	" 12	95	2,640	29	14	27
Abundance	" 9	" 12	95	2,520	23	18	31

BARLEY—RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

No. 1—Odessa	May 5	Aug. 6	93	3,000	40	40	48
Canadian Thorpe	" 5	" 8	95	4,400	44	8	50
No. 2—Odessa	" 12	" 11	91	4,000	29	8	47½
Canadian Thorpe	" 12	" 13	93	4,000	25	..	49½
No. 3—Odessa	" 19	" 15	88	2,800	23	16	47
Canadian Thorpe	" 19	" 18	91	3,800	24	8	49
No. 4—Odessa	" 26	" 26	92	3,000	25	..	46
Canadian Thorpe	" 26	" 26	92	2,840	25	40	50
No. 5—Odessa	June 2	Sept. 5	93	2,800	31	32	46
Canadian Thorpe	" 2	" 5	93	2,920	25	40	49
No. 6—Odessa	" 9	" 12	93	2,320	23	16	40
Canadian Thorpe	" 9	" 12	93	2,520	25	..	45

SPRING WHEAT—EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing	Weight of Straw per acre.	Yield per acre.		Weight per Bushel.
				Lbs.	Bush.	Lbs.	Lbs.
No. 1—Red Fife	May 5	Aug. 20	107	2,500	20	..	57
Stanley	" 5	" 20	107	2,200	18	..	57
No. 2—Red Fife	" 12	" 24	105	2,540	21	20	56
Stanley	" 12	" 24	105	2,000	16	..	56
No. 3—Red Fife	" 19	" 30	103	1,920	14	..	57
Stanley	" 19	" 30	103	2,080	15	20	56
No. 4—Red Fife	" 26	Sept. 4	101	2,040	17	20	58
Stanley	" 26	" 4	101	2,280	14	..	55
No. 5—Red Fife	June 2	" 11	103	1,920	15	20	55
Stanley	" 2	" 11	103	1,880	12	40	52
No. 6—Red Fife	" 9	*	....	....	....	....	....
Stanley	" 9	*	....	....	....	....	....

PEASE—EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing	Weight of Straw per acre.	Yield per acre.		Weight per Bushel.
No. 1—Golden Vine	May 5	Aug. 15	102	1,800	11	20	54
Mummy	" 5	" 15	102	1,800	12	..	58
No. 2—Golden Vine	" 12	" 22	102	1,800	12	..	54
Mummy	" 12	" 22	102	1,880	11	20	56
No. 3—Golden Vine	" 19	" 27	100	1,400	9	20	54
Mummy	" 19	" 27	100	1,440	10	40	58
No. 4—Golden Vine	" 26	" 30	98	1,080	8	..	56
Mummy	" 26	" 30	98	1,120	10	..	57
No. 5—Golden Vine	June 2	Sept. 4	94	1,080	11	..	56
Mummy	" 2	" 4	94	1,720	13	20	56
No. 6—Golden Vine	" 9	" 9	94	1,320	9	20	55
Mummy	" 9	" 9	94	1,360	11	20	55

*Destroyed by frost.

EXPERIMENTS WITH INDIAN CORN.

The previous crop grown on this land was hay. Stable manure at the rate of 20 30-bushel cart loads per acre was spread on the sod and ploughed under. The land was worked up and marked out in rows and hills 3 feet apart. Three barrels of ashes and 300 pounds of complete fertilizer per acre was sown as the seed was planted and covered in at the same time.

One set of plots was planted in rows 3 feet apart and a duplicate set alongside in hills 3 feet apart each way. The soil was a light clay loam. Twenty-five varieties were planted on June 1st and the following crops was obtained :—

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Condition when Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	In.				Sept. 26.	Tons.	Lbs.	Tons.	Lbs.
Thoroughbred White Flint	102	Very	....	....	Tasselled	23	1,850	22	1,650
Early Mastodon	108	Fairly	....	....	"	21	1,450	19	830
Sanford	90	Very	Aug. 20	Aug. 25	Soft glazed	20	1,800	20	150
Red Cob Ensilage	100	"	....	....	Tasselled	18	300	22	....
Pearce's Prolific	80	"	Aug. 18	Aug. 25	Soft glazed	17	1,200	15	1,350
White Cap Yellow Dent	102	"	" 25	" 30	"	17	1,200	18	300
Longfellow	84	"	" 18	" 25	"	17	650	16	1,550
Canada White Flint	84	Fairly	" 20	" 25	"	17	100	16	450
King of the Earliest	90	"	" 18	" 27	"	17	100	12	970
Mamm. Eight-rowed Flint	96	Very	" 20	" 27	"	16	1,770	17	100

INDIAN CORN—TEST OF VARIETIES.—*Concluded.*

Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Condition when Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	In.				Sept. 26.	Tons.	Lbs.	Tons.	Lbs.
North Dakota White	100	Very	Aug. 20	Aug. 27	Soft glazed	16	1,770	15	1,130
Mammoth Cuban	120	"	" 27	Sept. 1	"	16	1,770	12	750
Kendall's Giant	80	"	" 20	Aug. 27	"	16	1,560	15	1,650
Giant Prolific Ensilage	96	Fairly	....	....	Tasselled	16	1,550	19	500
Compton's Early	80	"	Aug. 18	Aug. 25	Soft glazed	16	1,550	14	270
Champion White Pearl	106	"	" 28	Sept. 1	Late milk	16	1,220	16	120
Angel of Midnight	80	"	" 18	Aug. 25	Soft glazed	16	450	14	350
Pride of the North	90	"	" 25	" 29	"	15	1,350	18	300
Extra Early Huron Dent	90	"	" 20	" 27	"	15	1,020	11	1,320
Selected Leaming	108	"	" 28	Sept. 1	Late milk	14	1,150	15	250
Cloud's Early Yellow	80	"	" 25	Aug. 31	Soft glazed	12	1,850	16	1,220
Early Butler	96	"	" 25	" 31	"	12	970	12	970
Evergreen Sugar	80	Leafy	" 27	" 31	"	11	550	12	1,300
Mitchell's Extra Early	60	"	" 4	" 18	Hard glazed	9	1,250	10	350
Ruby Mexican	72	"	....	....	Tasselled	9	150	12	200

CORN PLANTED AT DIFFERENT DISTANCES APART.

Three varieties of corn were used in this experiment, and three sets of rows were sown for each plot with duplicate plots in hills. The crop from the middle row of each plot was weighed and the yield per acre ascertained from it; by so doing the narrower or wider rows alongside would not influence the weight of the row cut.

These were grown on land similar to that on which the corn was grown for test of varieties and the same preparation was given. The plots were planted 1st June and cut 26th September. The wider rows gave a larger proportion of ears. The results obtained from this experiment are given below in yields per acre:—

INDIAN CORN GROWN AT DIFFERENT DISTANCES APART.

Varieties and how sown.	Rows.		Hills.	
Longfellow.	Tons.	Lbs.	Tons.	Lbs.
2 feet apart	18	1,950	17	1,475
2½ "	17	980	15	360
3 "	14	1,810	12	750
3½ "	12	998	14	1,243
4 "	11	1,017	10	1,450
Champion White Pearl.				
2 feet apart	23	1,355	22	550
2½ "	19	148	13	1,324
3 "	19	1,270	15	1,350
3½ "	17	903	12	527
4 "	13	1,782	10	1,037
Selected Leaming.				
2 feet apart	21	570	19	115
2½ "	18	696	16	208
3 "	16	1,550	13	950
3½ "	14	1,809	11	1,583
4 "	13	1,415	10	1,862

EXPERIMENTS WITH FERTILIZERS ON INDIAN CORN.

The land on which these experiments were conducted had previously grown hay and clover. The soil was a light clay loam, and the manure was spread on the sod and then ploughed under. The land was ploughed just before planting, was then worked up, and after the corn was planted the complete fertilizer was sown broadcast and harrowed in.

Plot 1.—Twenty 30-bushel cart loads of stable manure per acre and 250 lbs. of complete fertilizer were used per acre. The yield was 13½ tons per acre.

Plot 2.—250 lbs. of complete fertilizer was used per acre. The yield was 8 tons per acre.

Plot 3.—Had no fertilizer and no manure. The yield was 7 tons 1600 lbs. per acre.

It will be observed that the effect of the complete fertilizer on the weight of the corn crop was very slight. The field on which these tests were made was one-half acre, and the three plots referred to were $\frac{1}{20}$th acre each, and were measured off from the half acre.

EXPERIMENTS WITH TURNIPS.

The soil on which these were grown was of a clayey loam nature. The previous crop was corn. The land was ploughed in the spring and manured with twenty-five 30-bushel cart loads of stable manure per acre, after which it was again ploughed and worked up. Fertilizers at the rate of 250 lbs. of complete fertilizer per acre, 200 lbs. of bone meal and 200 lbs. of salt per acre were then sown broadcast and harrowed in, after which the drills were run up 28 inches apart.

Two sets of plots were sown, two weeks intervening between the sowings. The yield of all the root plots per acre has been calculated from the quantity obtained from two rows each 66 feet long. Nineteen varieties were sown, which gave the following results :—

TURNIPS.—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Carter's Elephant	May 25..	June 7..	Oct. 14..	Oct. 14..	30	1915	1031	55	25	25	833	45
Mammoth Clyde	" 25..	" 7..	" 14..	" 14..	30	1190	1019	50	21	755	712	25
Halewood's Bronze Top......	" 25..	" 7..	" 14..	" 14..	30	465	1007	45	29	1160	986	..
Hartley's Bronze............	" 25..	" 7..	" 14.	" 14..	30	175	1002	55	27	1535	925	35
Hall's Westbury............	" 25..	" 7..	" 14..	" 14..	29	1740	995	40	23	1125	785	25
Giant King	" 25..	" 7..	" 14..	" 14..	29	725	978	45	23	1125	785	25
Marquis of Lorne	" 25 .	" 7..	" 14 .	" 14..	29	...	966	40	26	490	874	50
Bangholm's Selected.........	" 29..	" 7..	" 14..	" 14..	28	840	947	20	21	50	700	50
Skirving's	" 25..	" 7.	" 14..	" 14..	28	1275	954	35	20	1650	694	10
Selected Champion..........	" 25..	" 7..	" 14..	" 14..	28	550	942	20	23	1415	790	15
Pearce's Prize Winner.......	" 25..	" 7..	" 14..	" 14..	28	175	935	15	22	225	737	5
Perfection Swede	" 25..	" 7..	" 14..	" 14..	28	115	935	15	28	1275	954	35
Selected Purple Top.........	" 25..	" 7..	" 14..	" 14..	27	1825	930	25	22	950	749	10
Drummond Purple Top......	" 25..	" 7..	" 14..	" 14..	27	1390	923	10	21	1790	729	50
Sutton's Champion	" 25..	" 7..	" 14..	" 14..	27	1390	923	10	22	515	741	55
Jumbo or Monarch......... .	" 25..	" 7..	" 14..	" 14..	27	1100	918	20	23	400	773	20
Shamrock Purple Top	" 25..	" 7..	" 14..	" 14..	27	375	906	15	21	1500	725	..
East Lothian................	" 25..	" 7..	" 14..	" 14..	27	375	906	15	23	400	773	20
Prize Purple Top............	" 25..	" 7..	" 14..	" 14..	26	925	882	5	25	1475	857	55

EXPERIMENTS WITH MANGELS.

Eighteen varieties of mangels were sown on the same kind of soil as that used in the experiments with turnips and received similar treatment. Two sowings were made of each variety and the following table gives the results obtained :—

MANGELS.—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Giant Yellow Intermediate (Steele)	May 25..	June 7..	Oct. 6..	Oct. 6..	30	1,635	1,027	15	25	1,475	857	55
Giant Yellow Globe	" 25..	" 7..	" 6..	" 6..	30	175	1,002	55	38	125	1,268	45
Giant Yellow Intermediate (Ewing)	" 25..	" 7..	" 6..	" 6..	29	1,450	990	50	18	1,700	628	20
Gate Post Yellow	" 25..	" 7..	" 6..	" 6..	29	725	978	45	16	1,350	555	50
Gate Post	" 25..	" 7..	" 6 .	" 6..	28	1,275	954	35	22	1,387	756	27
Giant Yellow Half-long	" 25..	" 7..	" 6..	" 6..	28	550	942	30	18	250	604	10
Mammoth Long Red	" 25..	" 7..	" 6..	" 6..	27	1,390	923	10	27	1,100	918	20
Champion Yellow Globe	" 25..	" 7..	" 6..	" 6..	26	925	882	5	24	140	802	20
Yellow Intermediate	" 25..	" 7..	" 6..	" 6..	25	1,040	850	40	23	1,850	797	30
Norbitan Giant	" 25..	" 7..	" 6..	" 6..	25	750	845	50	16	625	543	45
Prize Mamm. Long Red	" 25..	" 7..	" 6..	" 6..	23	1,415	790	15	23	1,850	797	30
Red Fleshed Globe	" 25..	" 7..	" 6..	" 6..	22	1,675	761	15	19	425	640	25
Warden Orange Globe	" 25..	" 7..	" 6..	" 6..	21	1,500	725	..	20	1,325	688	45
Ward's Large Oval-shaped	" 25..	" 7..	" 6..	" 6..	20	1,325	688	45	15	1,175	512	55
Canadian Giant	" 25..	" 7..	" 6..	" 6..	19	1,875	664	35	21	1,500	725	..
Red Fleshed Tankard	" 25..	" 7..	" 6..	" 6..	19	1,875	664	35	21	1,500	725	..
Selected Mamm. Long Red	" 25..	" 7..	" 6..	" 6..	19	1,875	664	35	19	1,875	664	35
Golden Fleshed Tankard	" 25..	" 7..	" 6..	" 6..	19	425	640	25	18	250	604	10

EXPERIMENTS WITH CARROTS.

Sixteen varieties of carrots were tested. The plots were on land similar to the mangel and turnip plots and received the same treatment. Two sowings were made of each variety and the yields obtained were as follows :—

CARROTS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Mamm. White Intermediate	May 25..	June 7..	Oct. 7..	Oct. 7..	17	75	567	55	13	1,555	459	15
Half-long White	" 25..	" 7..	" 7..	" 7..	16	915	548	35	14	275	471	15
White Belgian	" 25..	" 7..	" 7..	" 7..	15	740	512	20	8	1,855	297	15
Giant White Vosges	" 25..	" 7..	" 7..	" 7..	15	450	507	30	12	1,665	427	45
Improved Short White	" 25 .	" 7..	" 7..	" 7..	15	15	500	15	14	565	476	5
Green-Top White Orthe	" 25..	" 7..	" 7..	" 7..	14	1,725	495	25	10	735	345	35
Early Gem	" 25..	" 7..	" 7..	" 7..	14	1,000	483	20	14	565	476	5
Iverson's Champion	" 25..	" 7..	" 7..	" 7..	13	1,550	459	10	10	1,460	357	40
Half-long Chantenay	" 25..	" 7..	" 7..	" 7..	13	825	447	5	13	390	439	50
Ontario Champion	" 25..	" 7..	" 7..	" 7..	13	100	435	..	11	185	369	45
Yellow Intermediate	" 25..	" 7..	" 7..	" 7..	11	1,490	391	30	13	825	447	5
Carter's Orange Giant	" 25..	" 7..	" 7..	" 7..	11	40	367	20	10	1,315	355	15
Guerande or Oxheart	" 25..	" 7..	" 7..	" 7..	10	1,750	362	30	14	1,725	495	25
Long Orange or Surrey	" 25..	" 7..	" 7..	" 7..	9	1,865	331	5	9	415	306	55
Scarlet Altringham	" 25..	" 7..	" 7..	" 7..	8	240	270	40	10	300	338	20
French Intermediate	" 25..	" 7..	" 7..	" 7..	7	935	248	55	6	1,050	217	30

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were tested. These were grown on soil of similar character and prepared in the same manner as that on which the turnips, carrots and mangels were grown. Two sowings were made of each variety and the following results were obtained:—

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot		Yield per Acre. 2nd Plot	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Danish Red Top	May 25..	June 7..	Oct. 6..	Oct. 6..	28	1,565	959	25	19	1,585	659	45
Red Top Sugar..............	" 25..	" 7..	" 6..	" 6..	24	1,300	821	10	17	365	572	45
Danish Improved............	" 25..	" 7..	" 6..	" 6..	23	1,850	797	30	22	1,240	754	..
Improved Imperial.........	" 25..	" 7..	" 6..	" 6..	21	775	712	55	17	1,255	587	15
Wanzleben..................	" 25..	" 7..	" 6..	" 6..	16	625	543	45	14	335	472	15
Vilmorin's Improved........	" 25..	" 7..	" 6..	" 6..	15	1,175	519	35	11	765	379	25

EXPERIMENTS WITH POTATOES.

One hundred and two varieties of potatoes were planted all on the 4th of June on a light clay loam. The previous crop grown on this land was barley and the land had a good catch of clover on it which was ploughed under in the spring. This was then worked up and drills were run 30 inches apart. 400 pounds of "Pidgeon's" potato fertilizer was sown per acre in the drills and the seed planted. No barn-yard manure was used. The potatoes were sprayed with Bordeaux Mixture 27th July, 5th August and 11th August. Paris green was also used in the first two applications. The plots consisted of two rows each 66 feet long, and 30 inches apart. All the varieties were dug on the 22nd September, and the following yields were obtained.

Many of the varieties were injured more or less by rot. Among those which suffered most from this cause were the following—Lizzie's Pride, Maggie Murphy, Early Gem, American Giant, Honeoye Rose, Charles Downing, Pride of the Market, Carman No. 1, Columbus and Brownell's Winner.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Total Yield per Acre.		Yield per acre of Marketable.		Yield per Acre of Unmarketable.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Irish Daisy..........	448	48	385	..	63	48
Hale's Champion..........	402	36	343	12	59	24
Reading Giant..........	398	12	352	..	46	12
Seattle..........	387	12	347	36	39	36
McKenzie..........	387	12	349	48	37	24
Polaris..........	365	12	310	12	55	..
Money Maker..........	360	48	303	36	57	12
Great Divide..........	360	48	308	..	52	48
Lizzie's Pride..........	358	36	253	..	105	36
Bill Nye..........	358	36	303	48	52	48
Flemish Beauty..........	356	24	299	12	57	12
Carman No. 1..........	356	24	281	36	74	48
Delaware..........	354	12	327	48	26	24

POTATOES—TEST OF VARIETIES—*Continued.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Lee's Favourite	352	..	290	24	61	36
American Giant	349	48	277	12	72	36
Seedling No. 230	332	12	297	..	35	12
Irish Cobbler	332	12	261	48	70	24
Quaker City	330	..	279	24	50	36
Rural Blush	327	48	268	24	59	24
Earliest of All	327	48	270	36	57	12
Pride of the Table	325	36	237	36	88	..
Early Gem	321	12	270	36	50	36
New Variety No. 1	316	48	279	24	37	24
Carman No. 3	316	48	288	12	28	36
Maule's Thoroughbred	316	48	266	12	50	36
Clay Rose	314	36	261	48	52	48
King of the Roses	312	24	266	12	46	12
Early Six Weeks	312	24	253	..	59	24
Reeve's Rose	310	12	228	48	81	24
Charles Downing	303	36	193	36	110	..
Dreer's Standard	303	36	261	48	41	48
Late Puritan	303	36	235	24	68	12
Pearce's Prize Winner	301	24	248	36	52	48
Russell Seedling	301	24	233	12	68	12
Vanier	299	12	246	24	52	48
Hopeful	297	..	242	..	55	..
New Queen	297	..	270	36	26	24
Seedling No. 7	297	..	266	12	30	48
Bovee	294	48	233	12	61	36
Cambridge Russet	294	48	255	12	39	36
Peerless Junior	292	36	242	..	50	36
Ideal	288	12	244	12	44	..
Rose No. 9	288	12	259	36	28	36
Pride of the Market	288	12	211	12	77	..
Maggie Murphy	288	12	204	36	83	36
Honeoye Rose	286	..	220	..	66	..
State of Maine	283	48	261	48	22	..
Burpee's Extra Early	281	36	242	..	39	36
Queen of the Valley	279	24	233	12	46	12
Rochester Rose	275	..	246	24	28	36
Everett	270	36	197	..	83	36
London	270	36	213	24	57	12
Harbinger	264	..	200	12	63	48
Rural, No. 2	259	36	233	12	26	24
Green Mountain	257	24	198	..	59	24
Early White Prize	253	..	184	48	68	12
Troy Seedling	253	..	224	24	28	36
I. X. L.	250	48	215	36	35	12
Chicago Market	248	36	187	..	61	36
Beauty of Hebron	248	36	217	48	30	48
Vick's Extra Early	246	24	193	36	52	48
Columbus	244	12	176	..	68	12
American Wonder	242	..	204	36	37	24
Early Puritan	239	48	204	36	35	12
Thorburn	237	36	191	24	46	12
Orphans	231	..	198	..	33	..
Lightning Express	228	48	195	48	33	..
Brown's Rot Proof	224	24	180	24	44	..
Monroe County	224	24	169	24	55	..
Holborn Abundance	222	12	198	..	24	12
Crown Jewel	217	48	162	48	55	..
Algoma	217	48	147	24	70	24
Sharpe's Seedling	211	12	154	..	57	12
Early Rose	211	12	178	12	33	..
Wonder of the World	203	24	122	..	81	24
Seedling, No. 214	202	24	132	24	66	..
Early Norther	200	12	154	..	46	12
Early Ohio	198	..	165	..	33	..
Table King	198	..	154	..	44	..

POTATOES—TEST OF VARIETIES.—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Clarke's No. 1	198	..	167	12	30	48
General Gordon	195	48	143	..	52	48
Daisy	194	48	135	24	59	24
Sir Walter Raleigh	187	..	169	24	17	36
Ohio Junior	187	..	132	..	55	..
Brownell's Winner	182	36	138	36	44	..
Dakota Red	180	24	156	12	24	12
Early Harvest	178	12	136	24	41	48
White Beauty	171	36	138	36	33	..
Burnaby Seedling	169	24	136	24	33	..
Record	165	..	132	.	33	..
Stourbridge Glory	165	..	125	24	39	36
Good News	165	..	116	48	46	12
Uncle Sam	160	36	121	..	39	36
Freeman	160	36	125	24	35	12
Satisfaction	156	12	134	12	22	..
World's Fair	154	..	94	36	59	24
Early Sunrise	151	48	118	48	33	..
Prize Taker	149	36	129	48	19	48
Pearce's Extra Early	149	36	134	12	15	24
Empire State	145	12	99	..	46	12
Victor Rose	145	12	94	36	50	36
Northern Spy	145	12	125	24	19	48
Houlton Rose	145	12	79	12	66	..
Fill-Basket	132	..	110	..	22	..

EXPERIMENTS WITH JAPANESE MILLET.

The land on which this millet was grown was previously in timothy and clover. The soil was a clay loam, and no fertilizer was applied. The seed of this millet from Japan was forwarded by the Director with instructions for conducting these experiments. The object was to gain information as to the best distance at which to sow this variety of millet to produce the largest returns. The seed was sown 5th June, and the crop harvested and weighed 13th September. The following table gives the yields obtained per acre.

How sown.	Yield per acre. Tons.	Lbs.
1, Sown broadcast	14	1,870
2, Sown in drills 15 inches apart	16	1,960
3, " 12 "	12	205
4, " 9 "	13	780

EXPERIMENTS WITH HORSE BEANS.

These experiments with horse beans, sown at different distances apart, were carried on in accordance with instructions from Ottawa, for the purpose of gaining information as to the quantity which could be grown upon an acre under different methods of planting, also to compare their value with soja beans grown under similar treatment. The soil on which these plots were grown was a clay loam in a fair state of fertility—complete fertilizer only at the rate of 400 pounds per acre was sown in the rows when the seed was planted. The plots were one-fortieth acre each. They were sown 5th June, and the crop was harvested 26th September. The following results were obtained :—

How Sown.	Yield per acre. Tons.	Lbs.
1, Sown in drills 2 feet apart	13	400
2, " 2½ "	11	1,400
3, " 3 "	9	....

EXPERIMENTS WITH SOJA BEANS.

The seed used in these experiments was of a very early variety of soja bean from Japan, sent by the Director. The experiments were planned with the object of finding out the best distance apart for growing this variety of bean, and also its value as a forage crop. They were grown in plots of one-fortieth acre each; these plots were adjoining those on which the horse beans were planted, and received similar treatment. The seed was sown 5th June, and the crop was cut and the following particulars obtained 26th September:—

How sown.	Yield per acre. Tons.	Lbs.
1, Sown in drills 2 feet apart	5	600
2, " $2\frac{1}{2}$ "	4	600
3, " 3 "	$3\frac{1}{2}$	...

FIELD CROPS OF ROOTS.

MANGELS.

The land used for this crop was in roots the year previous. It was ploughed in the spring and manured with twenty 30-bushel cart-loads of stable manure per acre, then ploughed again and worked up. 250 pounds of complete fertilizer, 200 pounds of bone-meal and 200 pounds of common salt were sown broadcast per acre. The rows were then drilled to twenty-eight inches apart. The seed of the varieties named was sown 28th May, and the yields were as follows:—

Name.	Yield per acre. Bush.	Lbs.
Yellow Globe	1,053	..
Giant Yellow Intermediate	971	20
Mammoth Long Red	955	16

TURNIPS.

The land for this crop was similar to that on which the mangels were grown. One-half of it, however, was in a barley crop the previous season. The same quantity of barn-yard manure was used and the land had the same treatment as the mangels, but in place of the additional fertilizers given to the mangels, Bowker's square brand fertilizer at the rate of 400 lbs. per acre was applied on one-half, and the Thomas' Phosphate at the rate of 400 lbs. per acre was applied to the remainder. The field of $1\frac{1}{3}$ acres yeilded 1,275 bushels. In this case there was a slight increase of yield of 750 lbs. only where the Bowkers fertilizer was used.

FIELD CARROTS.

These were grown on land adjoining the mangel plots and received the same kind of treatment. The following varieties were sown 28th May in two rows each 528 feet long:

Name.	Yield per Acre.			
Mammoth Intermediate	651 bush.	4	lbs.
Giant White Vosges	628 "	16	"
Half-long White	618 "	8	"
White Belgian	532 "	..	"
Short White Vosges	435 "	44	"
Orange Giant	397 "	44	"

GENERAL STATEMENT OF CROPS.

Five acres of marsh yielded 125 bushels of oats. The upland, in grain of different sorts, not including the plots and including 50 bushels of buckwheat, yielded 475 bushels, making a total of 600 bushels of grain.

The total root crop was 3,329½ bushels made up as follows: Turninps, 1,504 bush.; mangels, 1,517 bush.; carrots 257 bush. 44 lbs.; sugar beets, 50 bush. 49 lbs.

All the corn, except the uniform test plots of varieties and the plots sown at different widths, were sown with horse-beans, at the rate of one peck of horse-beans per acre with the usual quantity of corn. These were cut and weighed together and have been reckoned in this general estimate as corn crop. The horse-beans formed but a small percentage of the whole. About six acres in all were covered with this mixture. The sunflower heads amounted to 2 tons 215 lbs. The total amount of ensilage secured was 66 tons 905 lbs.

STOCK.—CATTLE.

In addition to the dairy stock that was on the farm, when I assumed the superintendency, fifteen grade cows and six thoroughbred cattle have been purchased. The stock now consists of :—

Two Guernsey cows, one Guernsey bull, two Guernsey bull calves; two Ayrshire cows, one bull (1 year old), two Ayrshire heifers; two Holstein cows, one Holstein bull calf, one Holstein heifer calf; twenty-five Grade cows.

Sixteen 2 and 3 year old steers, representing the Hereford, Polled Angus, and Shorthorn breeds were lately purchased. These, together with four scrub cattle, also lately purchased, are included in a feeding test which will be carried on this winter.

PIGS.

The thoroughbred stock of pigs kept are 3 Tamworths, 2 Yorkshires, and 2 Berkshires, with from 25 to 40 grades and crosses, which are disposed of from time to time, as pork, weighing from 140 to 180 pounds per carcase.

The value of the feed fed to the grade pigs during the year has been kept on record, with the object of finding out the value of the skim milk fed, with the result that, from 15 to 17 cents per hundred was obtained from it by converting it into pork. Experiments are now being conducted with different lots of pigs to determine the value of different grain feeds as well as that of skim milk for the production of pork.

SHEEP.

In the spring 24 sheep were purchased and put upon a very poor piece of land containing 10 acres. The object in so doing was to raise the fertility of that piece of land by the sheep alone without the additional use of commercial fertilizers or stable manure. Two acres of this field was fenced off and sown to rape for feeding later in the season; but the land was so poor that the crop grew only 3 inches high, and did not furnish much food. While the land may have been improved, the sheep did not do at all well; another season may give better results. There are at present on hand 25 old sheep and 4 lambs. The value of the remainder of the increase, and the wool, was given to the sheep in feed while on the pasture.

POULTRY.

The different breeds of poultry kept are :—

White Leghorns, of which there are in all.	20
Black Minorcas.	14
Plymouth Rocks.	9
White Wyandottes.	2
Pekin Ducks.	4

View on the Experimental Farm at Nappan, Nova Scotia, showing part of the Experimental Plots.

View on the Experimental Farm at Nappan, Nova Scotia, showing Farm Buildings and Group of Cattle.

No account has been kept of the number of eggs laid by the different breeds; that, however, will be attended to in future.

HORSES.

There are at present on the farm seven horses. During the past year three horses have been purchased to replace three of the oldest ones which were disposed of.

BEES.

Three colonies of bees were received from the Central Experimental Farm on the 1st of May last. These were immediately opened and appeared to be in good condition, but in the course of two weeks one of the hives was deserted, leaving two, which yielded 55 pounds of honey, in one pound sections, and two additional hives. These were put in the cellar of the superintendent's house 1st December, and weighed 58, 52½, 38 and and 36½ pounds respectively.

They were placed for winter in a part of the cellar furthest from the door, which now registers a temperature of 40 degrees. This place was partitioned off with matched lumber for the purpose of shutting out the light and also the heat from the furnace. The hives were placed on a shelf, 2 feet from the ground, which was resting on two boxes. The tops of the hives were covered with a cushion 4 inches thick made of chaff, and the sides were unprotected, the openings being left in the front of the hives.

IMPROVEMENTS.

Three new buildings were erected this fall, namely: Summer kitchen and wood-shed on the horticulturist's house, an extension of 34 feet to the pig house, and an ice house with refrigerator room. In the south-east corner of the main barn, directly over the cow-stable, a hen house has been fitted up. This is kept warm by the animal heat from the stable below, which is allowed to come in through openings in the floor. The stable below registers from 50° to 60°, and it is expected that the temperature of this room will not fall below freezing. A small room was also fitted up in one corner of the cellar of the superintendent's house for bees.

WATER SUPPLY.

The water supply up to this season has been very defective, but during the summer a spring was found in the wood about ¾ of a mile from the buildings, and this water has since been brought in galvanized iron pipes and put in all the buildings of the farm.

The water supply now shows every indication of being ample, and is apparently the finest of water. A sample of it has been sent to the chemist of the Experimental Farms, Ottawa, for analysis who has reported on this water as follows:

"On the 24th December, 1898, we received a sample of water taken from the new water supply at the Experimental Farm, Nappan, N.S. It was submitted to a careful examination, with the following result:—

	Parts per million.
Free Ammonia	·016
Albuminoid Ammonia	·086
Nitrogen as Nitrates and Nitrites	·094
Chlorine	4·8
Total Solids, at 100° C	58·4
Solids, after ignition	38·4
Loss on ignition	20·0
Phosphates	very slight traces.

"The water, as received, was perfectly clear, brilliant and odourless. It possessed a faint yellow tint when viewed in the 2-foot tube, due to slight traces of dissolved peaty matter.

"The analytical data show it to be an exceedingly good water, exceptionally pure, and one eminently suited to drinking and household purposes.

"FRANK T. SHUTT,
"*Chemist, Experimental Farms.*"

UNDERDRAINING.

The balance of the wood orchard was tile drained last fall, and since that a few drains were laid where greatly needed. It is hoped that more underdraining will be done next year, as the benefit of the draining done in the past is very apparent.

VISITORS.

A great number of people visited the farm during the year, especially in the summer months. There were five picnic parties to the farm during the summer. The largest being from Pictou County, N.S., on 7th July. From conversation with leading farmers in Prince Edward Island and New Brunswick, I have every reason to expect large excursion parties from each province another year.

CORRESPONDENCE.

Besides the distribution of reports and circulars, 1,573 letters were received and 1,384 were sent out.

DISTRIBUTION OF SEED GRAIN AND POTATOES.

In all 533 applicants have been supplied during the past year with 3 pounds samples of potatoes, oats, wheat, barley, pease, buckwheat and rye.

The number of packages sent out are as follows:

Potatoes	385
Oats	232
Wheat	137
Barley	122
Pease	93
Buckwheat	13
Rye	4
Total	986

EXPERIMENTS WITH MILCH COWS.

With a view to demonstrate whether a fairly good herd of dairy cows, getting credit for their products at current prices, and being charged for their feed at market rates, would leave a balance on the debit or credit side, an experiment was begun with all the cows in the herd at Nappan, on 28th November, 1897, and continued until 27th November, 1898.

As the prices of product and feed change so much for summer and winter, the experiment was divided into 26 weeks for winter, and the same for summer; and the prices of their product and feed averaged for each period. The cows were charged with all the feed they consumed. The bran, and most of the meal fed was bought and charged at the prices paid. The roots were valued at 5 cents per bushel, corn ensilage at 5 cents per bushel and hay at $6.00 per ton.

The feed was changed from time to time, the average cost of daily ration during the winter months, while in full milk, was 16 cents per day and $2.55 per month while dry. One of the different rations, while in full milk, was, corn ensilage 30 pounds at $2\frac{1}{2}$ cents, roots 30 pounds $2\frac{1}{2}$ cents, hay 12 pounds, $3\frac{3}{5}$ cents, chop (mixed grain) 4 pounds 4 cents, bran 3 pounds $2\frac{1}{4}$ cents, cotton seed meal $\frac{1}{2}$ pound $\frac{3}{4}$ cents—$15\frac{3}{5}$ cents. Another was corn ensilage 40 pounds, hay 20 pounds, chop 4 pounds, bran 3 pounds, cotton seed meal 1 pound—$16\frac{3}{4}$ cents.

Different quantities were fed to different cows, according to their ability to consume and produce, which was charged accordingly. Twelve were in full milk when the experiment was begun, the others coming in fresh at various times until spring.

The summer feed consisted of a rather poor pasture field, supplemented with $\frac{1}{4}$ acre green clover, 3 acres of vetches, oats and pease (grown together), 1 acre clover after grass and $\frac{1}{4}$ acre green corn, for which the cows were charged $1.50 per month while milking and $1 per month while dry. Some meal was fed in November to the cows fresh in milk, which was also charged.

They were kept in the stable from 28th November, 1897 to 1st June, 1898, with only an occasional fine day out in the yard. They were fed twice only, each day, and had water before them all the time, with the stable kept as near 60° Fahrenheit as possible. They were fed, cared for, and milked by the same person as regularly as possible.

From the 1st of June to 1st July, they were out night and day, during July, August and part of September they were out at nights and kept in during the day, the remainder of September and to 1st November they were out during the day and in at nights. After 1st November they were in all the time, except on occasional fine days, and were charged the same as in the winter months, making seven months winter feeding, and five summer feeding during the year. No charge was made for labour, the manure being put against that.

A careful record was kept of each cow's milk by weighing each milking as milked.

A sample of each cow's milk was taken twice each week, and the percentage of butter fat in it determined by the Babcock test, which test was carried on under the supervision of J. E. Hopkins, superintendent of the Nappan Creamery. The weight of butter was determined on the basis of 84 pounds of butter fat making 100 pounds of marketable butter.

The milk was sent to the creamery, and the cows credited with the weight of butter produced, at the price paid to all patrons of the creamery, which averaged for the six winter months $20\frac{1}{7}$ cents, and 18 cents for the summer, less $4\frac{1}{2}$ cents per pound charged by the creamery for making butter and hauling milk. The skim milk was fed to pigs and calves, and credited to the cows at the rate of $12\frac{1}{2}$ cents per hundred pounds of skim milk.

The following table will show the results obtained. The figures are arranged in each case in two groups, one for each half year. Nos. 3, 4 and 27 were sent to the butcher at the end of the first six months.

EXPERIMENT WITH MILCH COWS.

Number.	Breed of Cows.	Days' Milking.	Lbs. Milk.	Per cent B. Fat.	Lbs. Butter.	Value Butter; 20½c. in Winter, 18c. in Summer.	Value Skim Milk.	Total Credit.	Cost of Feed.	Cost of making Butter at 4½c. per lb.	Total Cost.	Profit for Year.	Loss for Year.
						$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
6	Ayrshire Grade	*182	6,356	3·6	272·42	54 87	6 30	61 17	30 94	17 78	57 72	28 64	......
		†118	2,891	3·6	123·09	22 30	2 89	25 19	9 00				
17	Sh. Ayrshire Grade.	*159	5,187	4·2	259·35	52 24	5 18	57 42	28 98	18 00	46 98	28 53	.....
		†161	2,751	4·3	140·82	25 34	2 75	28 09	10 00				
22	Ayrshire Grade . ..	*182	5,123	3·9	237·85	47 90	5 12	53 02	29 12	16 76	55 42	24 57	... ..
		†119	2,696	4·2	134·80	24 28	2 69	26 97	9 54				
25	Jersey, Sh. Grade..	*153	4,513	3·8	208·92	42 08	4 51	46 59	26 94	16 50	53 44	24 37	. ...
		†161	2,820	4·7	157·78	28 40	2 82	31 22	10 00				
24	Guernsey	* 59	1,891	3·9	87·79	17 68	1 89	19 57	19 89	11 37	41 26	21 41	.....
		†168	3,224	4·3	165·09	29 86	3 24	33 10	10 00				
19	Jersey Grade.......	*182	3,606	5·2	223·22	44 96	3 60	48 56	27 30	15 89	52 73	21 41	......
		†106	2,189	5·0	130·02	23 40	2 18	25 58	9 54				
1	Holstein	*182	5,761	3·3	226·32	45 58	5 76	51 34	30 94	15 77	56 75	20 02	......
		†116	3,070	3·4	124·26	22 36	3 07	25 43	10 04				
15	Ayrshire Grade	*127	4,747	3·6	203·44	40 98	4 74	45 72	24 82	14 25	49 07	19 56	......
		†140	2,507	3·8	113·41	20 41	2 50	22 91	10 00				
7	Sh. Ayrshire Grade.	*107	3,886	3·4	157 29	31 68	3 88	35 56	23 49	13 63	47 12	19 00	......
		†161	3,312	3·7	145·88	26 25	3 31	29 56	10 00				
18	Ayrshire Grade.....	*182	4,643	3·9	215·56	43 42	4 64	48 06	27 30	14 50	51 80	17 76	......
		†147	2,249	4·0	107·00	19 26	2 24	21 50	10 00				
21	"	* 51	1,853	3·4	75·00	15 10	1 85	16 95	19 80	13 15	42 95	17 18	.....
		†182	4,058	4·5	217·39	39 13	4 05	43 18	10 00				
28	"	*132	3,710	3·9	172·25	34 69	3 71	38 40	24 05	13 70	47 75	17 10	.... .
		†168	2,646	4·2	132·36	23 81	2 64	26 45	10 00				
11	Ayrshire	*182	4,271	3·5	177·95	35 84	4 27	40 11	27 30	13 95	50 79	16 03	......
		†105	2,992	3·7	131·79	23 72	2 99	26 71	9 54				
9	Sh. Ayrshire Grade.	*182	4,991	3·3	196·07	39 49	4 99	44 48	29 12	14 33	53 49	15 92	......
		†114	2,862	3 6	122·65	22 07	2 86	24 93	10 04				
23	Ayrshire Grade	*182	4,411	4 0	210·00	42 30	4 41	46 71	29 12	14 02	52 18	14 88	......
		†105	2,220	3·8	100·42	18 07	2 22	20 29	9 04				
14	"	*128	3,518	3·5	146 58	29 52	3 51	33 03	25 07	13 18	48 25	13 56	.....
		†147	2,931	4·2	146·55	26 37	2 39	28 76	10 00				
5	"	*182	4,498	3·6	192·77	38 82	4 49	43 31	29 12	13 76	52 92	13 27	......
		†119	2,504	3·8	113·27	20 38	2 50	22 88	10 04				
26	Jersey Grade	* 32	1,165	4·0	55·47	11 17	1 16	12 33	17 87	11 42	39 29	12 74	......
		†182	3,971	4·2	198·55	35 73	3 97	39 70	10 00				
2	Holstein	*144	5,017	3·0	179 17	36 08	5 01	41 09	27 71	12 55	49 26	12 58	......
		†119	2,794	3·0	99·78	17 96	2 79	20 75	9 00				
29	Guernsey	* 77	2,037	4·2	101·85	20 51	2 03	22 54	20 47	11 87	42 54	11 92	......
		†168	2,568	5·3	162·02	29 16	2 56	31 74	10 00				
8	Ayrshire Grade	* 54	1,877	3·3	73·73	14 85	1 87	16 72	20 06	11 31	41 37	11 80	......
		†182	4,529	3·3	177·92	32 02	4 52	36 54	10 00				
12	"	*182	3,388	3·7	149·25	30 06	3 38	33 44	27 30	11 68	47 98	7 73	......
		†161	2,381	3·9	110·54	19 89	2 38	22 27	9 00				
13	"	*128	3,555	3·6	152·35	30 68	3 55	34 23	25 07	10 93	46 00	6 63	......
		†119	2,061	3·7	90·78	16 34	2 06	18 40	10 00				
10	Sh. Ayrshire Grade.	*182	4,587	3·3	180·20	36 29	4 58	40 87	29 12	11 45	50 11	6 01	......
		† 91	1,841	3·4	74·51	13 41	1 84	15 25	9 54				
20	Ayrshire Grade	*151	3,729	3·8	168·69	33 97	3 72	37 69	26 79	10 41	46 20	4 10	......
		† 70	1,319	4·0	62·80	11 30	1 31	12 61	9 00				
16	"	*182	4,200	3·6	180 00	36 25	4 20	40 45	30 94	10 13	50 07	......	0 48
		† 63	1,000	3·8	45·23	8 14	1 00	9 14	9 00				
27	Sh. Ayrshire Grade.	*114	2,443	3·8	110·51	22 25	2 44	24 69	18 24	4 97	23 21	1 48	......
		†...	......	....	.... .	....	......	.	......				
4	Sh. Grade..........	*115	2,605	3·3	102·33	20 61	2 60	23 21	18 40	4 60	23 00	0 21	......
		†...	....	....	......	....	......	......	. ...				
3	"	*115	2,647	5·0	95·00	19 13	2 64	21 77	18 40	4 27	22 67	......	0 90
		†...	.....	....	......	......	......	......	......				

* Winter. † Summer. Number 16 had been milking 210 days before entering test. Numbers 3, 4 and 27 sold to butcher at end of first half of test.

One striking fact is that cows of equal quality (as near as can be judged) which were fresh in the fall gave more profit than their equals fresh in the spring, besides consuming more of the rough products of the farm. For instance, Nos. 21, 24 and 26 were fresh in the spring, and consumed $117.62 worth of feed, paid for it and left a balance of $63.13 to their credit. While Nos. 6, 17, 22 and 25 that were fresh in the fall consumed $154.51, paid for it and left a balance of $106.11, being $10.75 per cow in favour of the fall calved cow.

EXHIBITIONS ATTENDED.

An exhibit of the farm produce was made at St. John, N.B., from 13th September to 20th, and at Halifax, N.S., from 22nd September to the 29th. I also attended the exhibitions held at New Glasgow, N.S., and Sussex, N.B.

MEETINGS ATTENDED.

Considerable interest has been shown in farm matters; judging from the requests to address agricultural gatherings at different places. Many of these requests could not be complied with, but I have met with the farmers and addressed meetings at the following places during the past year :—

28th December, Truro, N.S.; 4th January, Scotch Hill, N.S.; 12th January, Kingston, N.B.; 13th January, Buctouche, N.B.; 14th January, Fox Creek, N.B.; 17th January, Great Village, N.S.; 18th January, Bass River, N.S.; 19th Brookfield, N.S.; 21st and 22nd January, Antigonish, N.S.; 25th January, Shubenacadie, N.S.; 27th January, Wolfville, N.S.; 31st January, West Bay Road, N.S.; 1st February, Milford, N.S.; 3rd February, Baddeck, N.S.; 4th February, North East Margaree, N.S.; 5th February, Margaree Forks, N.S.; 7th February, Strathlorne, N.S.; 9th and 10th Truro, N.S.; 11th Mapleton, N.B.; 16th, 17th and 18th, Fredericton, N.B.; 21st February, Pugwash, N.S.; 22nd February, River John, N.S.; 23rd February, Durham, N.S.; 24th February, Westville, N.S.; 26th February, Bridgeville, N.S.; 3rd March, Charlottetown, P.E.I.; 4th March, Montague, P.E.I.; 5th March, Murray Harbour, P.E.I.; 8th March, Kensington, P.E.I.; 9th March, Summerside, P.E.I.; 9th March, Tyne Valley, P.E.I.; 10th March, Alberton, P.E.I.; 1st April, Middle River, N.S.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

To DR WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work done in the Horticultural Division of the Experimental Farm for the Maritime Provinces for the year 1898.

The apple crop in Nova Scotia during the past year has been an average one; except in the counties of King's and Annapolis, from which only a fair crop is reported. In New Brunswick the summer and fall crop of apples was up to the average with a fair crop of winter fruit. From Prince Edward Island the report is a fair crop of apples. The first New Brunswick grown apples were exported to the British market this fall, showing that sure progress is being made in that province in the fruit growing industry.

Plums were an average crop throughout the province of Nova Scotia, while in New Brunswick the crop was not up to the average. Pears were not an average crop and the quality was not as good as usual. Raspberries were an average crop in the provinces, and strawberries are reported below the average, both as to yield and quality. Gooseberries were only a fair crop.

A few fruit trees were planted in the orchards on the Experimental Farm at Nappan, to replace some that had died. All the trees have made fair growth and No. 1. orchard produced some well coloured fruit of fair quality, but small. Those planted in Orchard No. 2, where protection is afforded by the shelter-belt of spruces, have made good growth. This orchard is well underdrained, the tiles having being laid 3 feet deep between each row of trees, making the drains 24 feet apart.

A plot of ground to the south of the horticulturist's house consisting of about 1½ acres has been set aside for experimenting with small fruits, vegetables, and other such work coming under the horticultural department. On this new piece of ground new varieties of small fruit have been set out; some experiments have been carried on with different kinds of fertilizers to gain information as to the value of such for forcing vegetables for early market. Experiments have also been conducted with potatoes grown under different modes of treatment. This land is clay loam and had previously been in hay, one-half of this ground was the site of an old orchard which was removed before ploughing in the fall of 1897.

A shelter-belt has been planted along the boundary fence on the south side of the above field. The trees were put in rows 10 feet apart and 20 feet apart in the rows. One row was planted with the heavy-wooded pine *Pinus ponderosa* and one with Norway spruce *Abies excelsa*.

Data on the blossoming period of the different varieties of fruits grown on the farm were again furnished the horticulturist of the Central Experimental Farm.

The ornamental trees, shrubs and hedges have made good growth, and a few new varieties have been added to the list.

The flower garden presented its usual appearance, and the added new varieties of flowers and bulbs helped to make an interesting collection. The Japanese Irises and Pæonies all lived, with the exception of three varieties of each, and although only a few bloomed, they were much admired. Arrangements have been made for an extension in the flower department, which will enable us to show a much larger collection of both annual and perennial flowering plants.

I beg to acknowledge the receipt of a number of seedling apple stocks and scions from Messrs. John Robertson & Sons, Inkerman, New Perth, P.E.I. These were used and the root-grafts have made splendid growth. Three trees of the Banks apple were also kindly donated by A. S. Banks, of Waterville, King's County, N.S., which have been duly planted.

ORNAMENTAL TREES AND SHRUBS.

Year by year we find a growing desire amongst our people to plant around their dwellings and along the road side ornamental trees and shrubbery. Every farmer thinks more or less of planting some trees to make his home more attractive, but the dairy farmer's time is often too fully occupied to attempt planting and caring for any considerable number of varieties. The first step to be taken, and the one too often neglected when planning for the ornamentation of the home in this way, is the preparation of the soil for a nice lawn.

If only a small place is to be planted. the Norway and Sugar Maple, the American and European Elm, the Austrian and White Pine, and the Norway and Black Spruce make very handsome specimens. For larger lawns the above named varieties with the Colorado Blue Spruce, Pyramidal Arbor-vitæ, Purple Birch, White Birch, European Linden, European Mountain Ash, American Ash, Box Elder, English Oak and Red Maple.

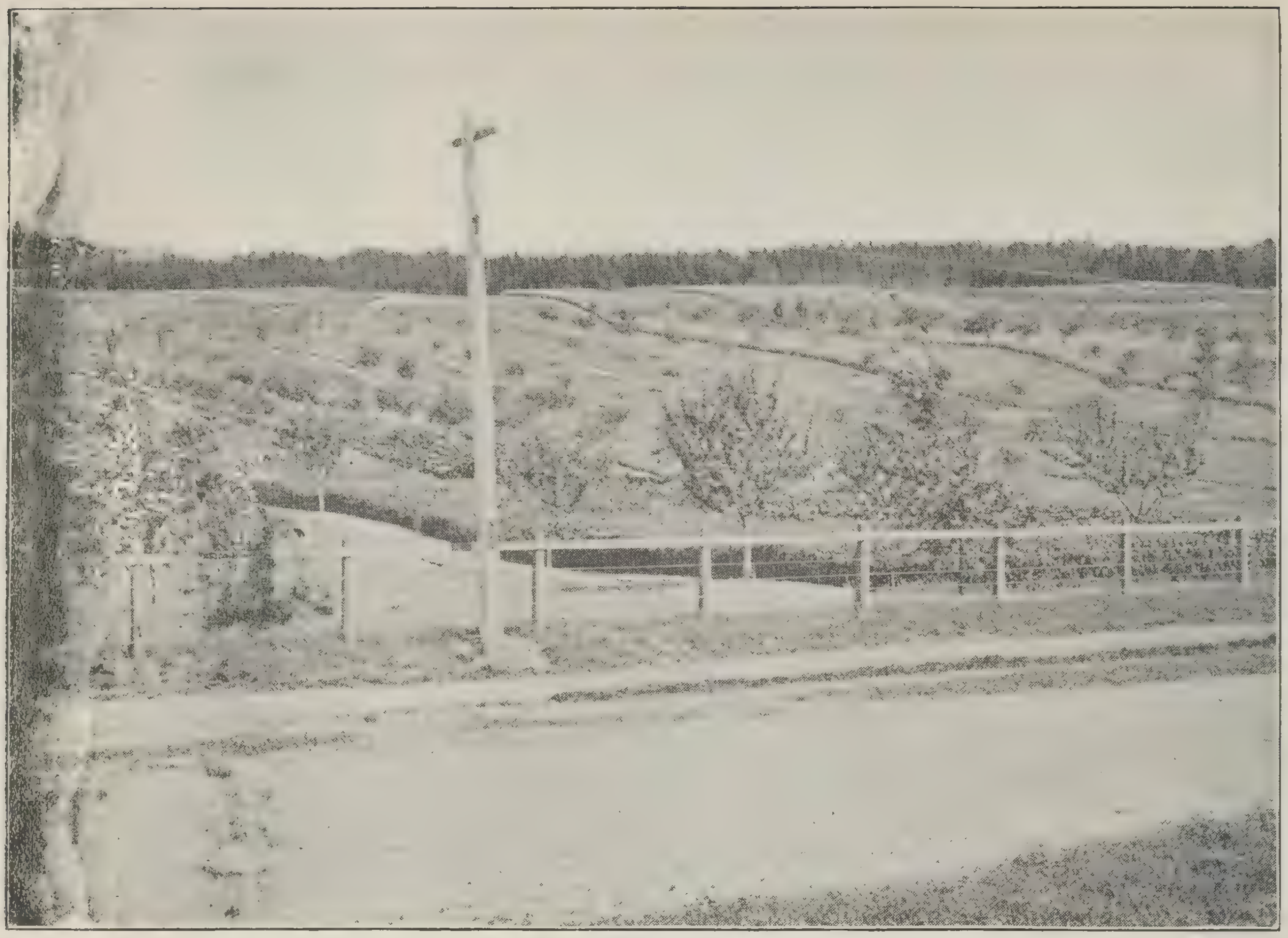
In planting trees about a house they should be arranged so as to preserve an outlook when the trees have grown. Imitate nature as far as possible, so that from the windows of the house the view shall be pleasing. Do not plant too close to the house nor overcrowd the lawn. Always bear in mind that the trees are planted to remain, and the planter should have in mind at the time of planting the size the trees will attain when they are 25 or 30 years old, so that the mistake of close planting may be avoided.

Shrubbery may be planted with advantage in groups or clumps 8 to 10 or 12 feet apart along the driveway at points and turns and also at certain positions to form a background. No ground space around a dwelling is so small that some shrubs cannot be used to advantage, and they are objects of great beauty, especially when in bloom. Such varieties as Spiræa Van Houtte, which has drooping limbs covered with white flowers lasting from two to three weeks, Spiræa Callosa Alba ; different varieties of lilacs, such as Josika, Charles X., and the white lilac, *S. vulgaris alba ;* mock orange, *Philadelphus coronarius* and *grandiflora*, weigelia rosea ; Deutzias, especially the variety known as *gracilis*, which is of dwarf habit ; Golden-leaved Elder, *Sambucus Canadensis Aurea ;* purple-leaved plum, *Prunus Pissardi* ; the common snowball, *Viburnum opulus sterilis ;* shrubby cinquefoil, which gives a yellow bloom almost the entire season ; Tartarian Bush Honeysuckles, Japanese and Purple Barberry, Japanese Hydrangea, and Cytisus Purpurea. For evergreens the Dwarf Mountain Pine, the Retinosporas, such as the plumosa, aurea and filifera ; some of the many varieties of arbor-vitæ, such as the Compact, Globose, Hoveyi and variegated, and the Holly Barberry.

The following table gives the present height of some of the ornamental trees and shrubs planted around the superintendent's house in 1891, showing the vigorous growth they have made since that time :—

Ornamental Trees—Planted in 1891.

Name.	Present Height.	Circumference at the Base of Trunk.
	Feet.	Inches.
Norway Spruce—*Picea Excelsa*	13	17
Norway Maple—*Acer platanoides*	17	16
European Mountain Ash—*Pyrus aucuparia*	13	14
Common Arbor-Vitæ—*Thuya occidentalis*	9	12
Colorado Blue Spruce—*Picea pungens*	8	13½
English Oak—*Quercus Robur*	11½	8
American Elm—*Ulmus Americana*	17	13
Siberian Poplar—*Populus certinensis*	25	32
Scotch Pine—*Pinus sylvestris*	16	19
Austrian Pine—*Pinus Austriaca*	13	17
American Ash—*Fraxinus Americana*	15½	14
White Birch—*Betula alba*	18	17
European Larch—*Larix Europea*	19½	18
European Linden—*Tilia Europea*	8	17



View of Orchard on the Experimental Farm at Nappan, Nova Scotia.

View showing residence of Superintendent, and part of planting on the Experimental Farm at Nappan, Nova Scotia.

Shrubs—Planted in 1891.

Name.	Present Height.	Blossoming Period.
	Feet.	
Plumose retinospora	4	
Aurea, Golden pl. retinospora	3	
Thread-like "	2½	
Dwarf Mountain Pine	2	
Missouri Currant	5	May 24 to June 13.
Josika's Lilac	6	June 6 to 15.
Thunberg's Barberry	2½	
Bush Honeysuckle	9	June 5 to 16.
" Red and White	7	" 11 to July 1.
Asiatic Maple	7	
Siberian Pea Tree	5	May 29 to June 15.
High Bush Cranberry	5	June 14 to 28.
Common Snowball	5	" 10.
Spiræe Callosa	6	" 8.
Spiræa Van Houttei	4½	" 7 to 26.
Weigelia Rosea	4½	" 15.
White Lilac	4½	" 7.
Potentilla fruticosa	3½	" 6.
Thuya occidentalis—hedge	5	

WINDBREAK OF SPRUCE AND PINE.

In the spring of 1891 two rows of evergreen trees were set 10 feet apart along the boundary fence near the orchard. The trees were planted 20 feet apart in the rows, and one row was set with Norway Spruce (*Picea excelsa*) and one with Scotch Pine (*Pinus sylvestris*). They were planted so that one row would break the openings in the other. Back of those and close to the fence, but 15 feet from the row of spruces; hardwood trees were planted 40 feet apart. These trees have made vigorous growth and the space between the rows is now almost entirely filled up. The pines are from 14 to 16 feet high, measuring in circumference at the base of the trunk from 18 to 25 inches. The spruces are from 13 to 17 feet high and the trunks measure from 15 to 18 inches in circumference at the base. The Norway Maples are from 16 to 18 feet high and measure from 14 to 16 inches at the base.

LAWN.

There is nothing so attractive around a place as a good lawn. In order to have such a lawn the ground must be thoroughly worked up and enriched. It is impossible to form a good lawn by simply ploughing up a piece of worn out land and seeding it down to grass. Plough deeply and thoroughly work in a good dressing of well rotted stable manure, then harrow and grade off the land so as to make it as even as possible for seeding. A mixture has been tried here of 5 pounds of Kentucky Blue Grass to 1 pound of White Clover, sown at the rate of 5 bushels per acre, which has made a good lawn. Another mixture for lawn seeding that has given good results is 2 pounds of White Clover to a bushel of half and half Red Top and Blue Grass at the rate of 5 bushels per acre. The Red Top stands drought better than the Blue Grass, but if the land is inclined to be wet or shaded, the first named mixture would probably give the best satisfaction. If not sown thickly, the Red Top is liable to grow bunchy, and make an uneven lawn. The seed should be sown carefully so that a good even growth will be obtained. The best way to cover the seed is to scatter, with a sieve, fine rich earth over it; should it be raked in the greatest care is necessary to get it covered evenly,

after which roll the lawn thoroughly. The best time to prepare a lawn is in the spring and it will require little attention again that season except to keep down any weeds that may grow.

SMALL FRUITS.

A considerable number of new varieties of small fruits, such as gooseberries, currants, raspberries, blackberries and strawberries, have been added this year to those previously grown. The old raspberry plots as stated last year are diseased with anthracnose and new plants were obtained for new plots. It is found that to cut out the canes as soon as they have fruited is the best way to keep this disease in check. The yield obtained from each row in the old raspberry plots is given below. Each plot occupies a space 6 by 132 feet, the rows being 132 feet long and 6 feet apart. The plants were set in the spring of 1894, and have had no manure nor other fertilizer since planted.

The strawberry plots were planted in the spring of 1897 in plots of two rows, each 16 feet long and 3 feet apart. A space of 4 feet was allowed between the plots. The plots were allowed to grow in the matted row system and each plot was squared up to occupy a space $16\frac{1}{2}$ by 6 feet or 99 square feet. The land on which these were grown was manured in the fall of 1896 after ploughing and the manure worked in the following spring. 330 pounds nitrate of soda, 330 pounds fine ground bone and 440 pounds hardwood ashes per acre were sown broadcast on the plots on 29th April. The crop harvested from these plots is given in the table which follows.

The English gooseberries have made fair growth. The mildew has not troubled the plants, and an occasional spraying with Bordeaux mixture has kept all fungous diseases in check. In this fruit the weight of crop given is the average yield per bush of the varieties tested.

RASPBERRIES.

Name.	1897.		1898.	
	Period of Ripening.	Number of Pounds from 1 Row 132 ft. long.	Period of Ripening.	Number of Pounds from 1 Row 132 ft. long.
Hansell	July 26 to Aug. 16	12	July 27 to Aug. 10	14
Heebner	" 26 " 16	36	" 27 " 10	29
Niagara	" 31 " 16	12	" 27 " 10	$19\frac{1}{2}$
Clarke	" 26 " 16	20	" 27 " 10	$19\frac{3}{4}$
Marlboro	" 26 " 7	22	" 27 " 10	19
Cuthbert	" 30 " 16	26	" 28 " 10	$19\frac{1}{2}$
Caroline	" 31 " 9	30	" 28 " 6	$18\frac{1}{4}$
Hornet	" 31 " 16	16	" 30 " 10	$14\frac{1}{4}$
Hudson River Antwerp	" 31 " 16	23	" 30 " 6	21

STRAWBERRIES.

Number.	Name.	Sex.	When Picked—July. 9th.	11th.	13th.	16th.	18th.	20th.	23rd	25th.	Total yield of plot, 1898, 16½ by 6 ft. = 99 sq. ft. Lbs.	Oz.	Number of runners.
			Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Lbs.	Oz.	
1	Brandywine	B	....	7½	22	44	19½	23	18	....	8	6	Many.
2	Bisel	P	....	24	24	83½	42	....	31	....	12	12½	"
3	Beverly	B	....	51	15½	18	....	39½	22½	....	9	2½	"
4	Beder Wood	B	....	89	36	20½	....	69½	14½	11	15	½	"
5	Burton's	P	17	56	23	22	22	....	14	5½	9	15½	"
6	Bubach	B	16	58½	45½	42½	....	33½	....	9½	12	13	Few.
7	Captain Jack	B	13	20½	38	48½	....	64½	67	7	16	2½	Fair.
8	Clark's Early	B	....	19½	21½	25	....	47½	9	....	7	10½	"
9	Chairs	B	....	42½	58	39	....	50½	25½	16	14	7½	"
10	Crescent	P	....	138½	55	45	....	75	49	....	22	10½	"
11	Enhance	B	....	18	25	33	....	43	49½	22	11	14½	Many.
12	Equinox	B	....	....	....	11	25	....	19½	14	4	5½	Fair.
13	Greenville	P	....	42	24	45½	....	....	32	7	9	6½	Few.
14	H. W. Beecher	B	....	39	45½	128½	121	95	66	16	31	15	Many.
15	Haverland	B	....	24	40½	34	40½	....	14	....	9	9	Few.
16	Jas. Vick	B	....	11	....	107½	40½	146½	....	42	21	11½	Many.
17	John Little	B	....	98	75	19½	....	42	40	....	17	2½	"
18	Leader	B	....	17	13½	20	9½	4	6½	....	4	6½	Fair.
19	Otsego	P	....	....	20	38	....	86½	19½	9	10	13	"
20	Pearl	B	17	70½	22½	38	....	61½	....	....	13	1½	"
21	Paris King	B	....	50½	22½	19	....	21½	9½	....	7	11	Many.
22	Parker Earle	B	18	46½	32½	21½	....	67	38	....	13	15½	Fair.
23	Robinson	B	16	35½	23	60½	....	....	11	....	9	2	Many.
24	Shirts	B	....	21	38	73	36	30½	34½	....	14	9	Fair.
25	Sharpless	B	....	37½	25½	33	55	40½	39½	14	15	5	"
26	Swindle	B	....	20½	29½	22	....	39	43	13	10	7	"
27	Seneca Queen	B	....	30½	....	19½	....	16	....	....	4	2	"
28	Thompson's Late	P	....	19½	7½	12½	4½	....	....	....	2	12	"
29	Tennessee Prolific	B	....	61	21½	17	....	42½	7	3½	9	8½	"
30	Wm. Belt	B	....	8½	17½	40	....	87½	40½	14	13		Many.
31	Warfield No. 2	P	....	70½	20½	....	....	27½	....	....	7	6½	Fair.
32	Wilson	B	17	33½	39½	50½	....	48	15½	....	12	12	Many.
33	Williams	B	....	34	21	78½	34	29	23½	....	13	12	Fair.
34	Woolverton	B	....	24½	5	9	....	9	..	....	2	15½	"
35	1001	P	....	21½	26	21½	24	11½	8	....	7	½	"

ENGLISH GOOSEBERRIES.

Name.	Size of Fruit.	Average Yield per Bush, 1897. Lbs.	Oz.	Average Yield per Bush, 1898. Lbs.	Oz.
Whenham's Industry	Large	4	4	2	12½
Leveller	"	1	7	2	4
Crown Bob	"	1	12	1	15
White Champagne	Medium	2	4	1	10
Queen Victoria	Large	1	12	1	5
Red Champagne	Medium	1	6	1	4½
Whitesmith	Large	2	..	4	11
Lancashire Lad	"	4	..	3	2

Garden Pease.—Test of Varieties.

Twenty varieties of garden pease were sown 17th May. The plots were 4 by 66 feet, on which two rows of pease were sown 6 inches apart and 66 feet long. The land was in poor condition, having previously been in hay. Stable manure at the rate of 25

tons per acre was ploughed under in the fall. The pease on one-half of each of these plots were pulled when fit for market, and the yield of green marketable pease in pods on the whole plot calculated. The other half was allowed to ripen from which the pounds of shelled ripe pease on the whole plot was calculated. The yield from the size of plot as given above was as follows:—

GARDEN PEASE.

Name.	When fit for Market.	Marketable Green Pease in pods. Yield per acre.	Length of Pod.	Number of Shelled Pease in a Pod.	Ounces of Shelled Pease in 1 lb. as pulled.	Pounds of Shelled Pease ripened per plot.	Quality.
		Lbs.	Inches.		Oz.	Lbs.	
1 Little Gem	July 13	22	2 —2½	6— 7	6	8½	Very good.
2 Simmer's Earliest of All	" 13	24	2½—2¾	7— 8	6	9	Good.
3 Maud S	" 13	18	2 —2¼	5— 7	6½	9	Fair.
4 Mill's First of All	" 13	40	2 —2½	6— 7	7	10	"
5 S. B. & M. Co.'s Extra Early	" 13	30	2¼—2½	7— 8	8	10	"
6 Sunol	" 13	28	2 —2¼	6— 7	8	6½	"
7 Ringleader	" 16	30	2 —2¼	6— 7	8	10	Good.
8 Bliss American Wonder	" 20	31	2¼—2½	7— 8	7	8	"
9 Pride of the Market	" 20	28	2 —2½	6— 7	7	8¾	"
10 Heroine	" 26	45	2¾—3¼	7— 8	7	8½	"
11 Stratagem	" 26	47	2½—3¼	6— 8	7½	12¼	"
12 Telegraph	" 26	36	3 —3¼	6— 7	9	8½	Fair.
13 Horsford's Market	" 26	32	2½—2¾	6— 7	7	10½	Good.
14 Daisy	" 26	37	3¼—3¾	9—10	7	8	Very good.
15 Burpee's Profusion	" 26	48	2 —2½	4— 5	7	10¾	Good.
16 Juno	" 26	54	3 —3½	6— 7	8	10	Fair.
17 Shropshire Hero	" 26	36	3 —3½	7— 8	8½	7¾	Good.
18 Hair's Dwarf Mammoth	" 26	52	2¼—2¾	5— 6	9½	9	Fair.
19 Pride	" 26	38	2 —2½	5— 6	9	10	"
20 Schwitzer's Giant	Aug. 1	68	3¾—4¼	7— 8	6	7¾	"

GARDEN PEASE.—TREATED IN DIFFERENT WAYS.

In order to gain information as to the value of nitrate of soda for the production of green marketable pease, eight plots were treated differently. The plots were 4 by 66 feet or $\frac{1}{165}$ of an acre, on which 2 rows were planted 6 inches apart and 66 feet long. The plots that were manured were alongside those of the variety test plots and received the same kind of treatment. The piece of land on which the balance of these plots were, had no manure, being left for a road alongside the other plots; but was not used for that purpose. All of the land was fall ploughed. The fertilizer sown when the

seed was planted was raked in by hand, and that sown after the seed was planted was also worked in by hand. The variety Heroine was used. The pease were pulled July 29th, and the yields as given in the following table was obtained:—

GARDEN PEASE.—TREATED DIFFERENTLY.

—	Kinds of fertilizers used and the quantity applied.	Yield of marketable green pease in pod from plot $\frac{1}{165}$ of an acre.
Plot 1	Stable manure and no fertilizers	36 pounds.
" 2	Stable manure and nitrate of soda 330 lbs. peracre	38 "
" 3	No manure. Nitrate of soda 330 lbs. per acre, given in two applications after the seed is planted at intervals of one and two weeks	32 "
" 4	No manure. Nitrate of soda 660 lbs. per acre, given in one application one week after the seed is planted	34 "
" 5	No manure. Nitrate of soda 330 lbs. per acre applied before planting	32 "
" 6	No manure and no fertilizers	28 "
" 7	No manure. Nitrate of soda 495 lbs. per acre applied before planting	30 "
" 8	No manure. Nitrate of soda 660 lbs. per acre applied before planting	30 "

TOMATOES.—TEST OF VARIETIES.

The first tomato seed was sown in the hot-bed 29th March. The plants were transplanted to the cold frame 23rd April, after which it came in cold and the plants all damped off. New plants were started in the hot-bed and these were transplanted when large enough to 4 inches apart in the hot-bed, which by this time contained little heat in itself. The plants remained there until 11th June, when they were set out in the open ground.

Five varieties were planted, one row of each kind 66 feet long and the plants were set 4 feet apart each way. The yield in pounds given is from a plot 4 by 66 feet or $\frac{1}{165}$ of an acre. Stable manure at the rate of 20 tons per acre was ploughed under the previous fall. The crop previously grown on this land was Timothy hay:—

TOMATOES.—TEST OF VARIETIES.

Name of Variety.	Fruit picked 5th September.	
	Ripe.	Green.
	Lbs.	Lbs.
Atlantic Prize	19½	252
Conqueror	6	120
Livingston's Beauty	4	88
New Imperial	2½	81
Early Ruby—not cut back	7½	156
" cut back 22nd August	7½	120

EXPERIMENT WITH CUTTING BACK TOMATO VINES TO PROMOTE MATURING.

In order to test the value of cutting away some of the non-fruit producing branches, so as to hasten the ripening period of the fruit, three hills of the following varieties were

cut back and the same number of hills were left untouched. The hills were treated alike. On 12th September the fruit was picked and the amount of ripe fruit obtained was as follows :—

Variety and how Treated.	Ripe.
	Lbs.
Imperial—cut back 29th August	4½
" not cut back	3¼
Early Ruby—cut back 22nd August	6¼
" " 29th "	8¾
" not cut back	6½

Corn.—Test of Varieties.

Three varieties of garden corn were planted 23rd May in hills 3 feet apart each way, and 5 plants were left to the hill. The first corn was pulled on 30th August. The following number of ears of each variety were taken from a row 66 feet long on the dates given :—

Name of Variety.	30th August.		10th September.	
	Number of Ears.	Weight of Ears.	Number of Ears.	Weight of Ears.
		Lbs.		Lbs.
Early Marblehead	66	32	44	22
Extra Early Cory	66	38	38	17½
Mitchell's Extra Early	70	34	50	27

AGRICULTURAL MEETINGS.

I attended the Nova Scotia Farmers' Association at Truro, N.S., the Nova Scotia Fruit Growers' Association at Wolfville, N.S., the New Brunswick Farmers' Association at Fredericton, N.B. I also addressed agricultural meetings at the following places :—

January 4th, Scotch Hill, N.S.,
" 7th, Bathurst, N.B.,
" 8th, Dalhousie, N.B.,
" 10th, Chatham, N.B.,
" 12th, Kingston, N.B.,
" 13th, Buctouche, N.B.,
" 14th, Fox Creek, N.B.,
" 15th, Hillsboro, N.B.,
" 17th, Port Elgin, N.B.,
" 22nd, Antigonish, N.S.,
" 25th, Shubenacadie, N.S.,
February 11th, Mapleton, N.B.,
" 13th, Sussex, N.B.,
" 14th, Armstrong's Cor., N.B.,
March 3rd, Charlottetown, P.E.I.,
" 4th, Montague, P.E.I.,
" 5th, Murray Harbour, P.E.I.,
" 8th, Kensington, P.E.I.,
March 9th, Summerside, P.E.I.,
" 9th, Tyne Valley, P.E.I.,
" 10th, Alberton, P.E.I.,
" 14th, Souris, P.E.I.,
June 21st, Narrows, N.B.,
" 22nd, McDonald's Point, N.B.,
" 23rd, Waterborough, "
" 24th, Douglas Harbour, "
" 25th, Chipman, "
" 27th, Newcastle Bridge, "
" 28th, Lakeville "
" 29th, Sheffield Academy, "
" 30th, Mangerville, "
July 2nd, Gagetown, "
" 12th, Bristol, "
" 13th, Glassville, "
" 14th, Bath, "
" 15th, Florenceville, "

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., 30th November, 1898.

To Dr. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my eleventh annual report, with details of the experiments undertaken and work accomplished on the Brandon Experimental Farm, during the past year.

Although the prospect was gloomy at times, the past season on the whole was a favourable one for the Agriculturist. Spring opened up about the average date and seeding commenced here on the 15th of April and was continued without hindrance until the close of the season. Wind storms were not as troublesome as usual, and no serious injury resulted from spring frosts which were so troublesome in 1897. The months of April and May proved very dry, not a shower falling until 25th of May. For a week or ten days previous to that date, there was very little growth and all grain wilted badly, but from that date onward showers were frequnnt and growth rapid.

Favourable weather continued through remainder of the growing season with the result that nearly all cereal, fodder and root crops averaged the largest ever grown on this farm. Wheat was, however, not as large a crop comparatively speaking as oats and barley, owing no doubt to the rains coming rather late for this grain.

The weather during cutting and stacking was unusually wet; greatly retarding harvest operations, and where stacks were badly built more or less of the grain was injured, fortunately the injury on the Experimental Farm from this cause was very slight.

The kernel of all kinds of grain is this year unusually large, but the colour is not equal to the usual standard. A feature of the year was the excellent quality of the straw, comparatively little of it either rusted or lodged, although the growth was very rank.

Attention is called to the large returns of wheat obtained after a crop of pease and to the fact that formalin has proved successful as a preventive of smut in oats, thus confirming the results obtained at the Central Experimental Farm at Ottawa, last year.

Clover sown without a nurse crop has again successfully wintered and the yield of wheat on clover land promises to be a profitable one. Japanese Millet has given a remarkable yield of fodder, and if its feeding properties are found to be good, it is of promise for this country. Awnless Brome Grass continues to give good results on this farm and reports from parties supplied with seed are generally satisfactory. Fodder Corn gave an abundant yield and reached an advanced stage of maturity. Trees and shrubs of all kinds have made good progress this year. The vegetable garden has given good returns, and a number of varieties of vegetables tested appear to be well suited to this country. Work in all lines on the Experimental Farm is expanding, the number of experiments undertaken being larger than heretofore; new land is being brought under cultivation and larger quantities of grain grown, all of which is in demand by resident farmers for seed purposes. The amount of correspondence is larger and the number of visitors is increasing each year.

EXPERIMENTS WITH WHEAT.

TEST OF VARIETIES.

The soil selected for these tests was not the most suitable for the purpose, being somewhat sticky and lacking in humus. The returns were, however, fair, and the quality of the grain excellent in nearly every instance.

Goose Wheat, the most productive variety this year, also headed the list in 1896. This is a hard flinty wheat evidently very productive here, but is inferior as a milling wheat. It is also later to mature than Red Fife.

Monarch, a beardless wheat, has been among the five most productive varieties for three years. It is a good, bright, heavy sample and would pass readily for Red Fife.

White Fife has now for three years in succession given a larger return here than the Red Fife, the average being about four bushels per acre in favour of White Fife.

Crown, a cross-bred wheat originated on the Experimental Farms, is one of the best bearded varieties grown here, it is productive and of good quality.

Wellman's Fife is very similar to Red Fife, but the head is longer and the kernels not so compactly placed in the ear. Although the head is longer it does not always produce as large a yield as the Red Fife.

A large proportion of those varieties, which gave the smaller crops, were badly affected with rust. The fife wheats are noticeable for their freedom from rust, the White Fife being particularly so.

The land for this test was summer-fallowed the previous year; the size of the plots was $\frac{1}{20}$ acre. The soil was a clay loam and all the plots were sown on 20th April.

WHEAT.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Goose	Aug. 26.	128	40	Stiff	4	Bearded	6,400	45	20	63	Slightly.
Monarch	" 24.	126	39	"	4	Beardless.	4,200	42	40	61	"
White Fife	" 24.	126	38	"	4	"	6,100	40	..	61	None.
Crown	" 23.	125	40	"	4	Bearded	5,400	38	20	61½	Slightly.
White Connell	" 24.	126	39	"	3½	Beardless.	5,400	37	20	61	"
Wellman's Fife	" 23.	125	42	"	4½	"	6,000	37	..	60	"
Red Fife	" 25.	127	36	"	3½	"	6,800	36	20	61½	"
Hungarian	" 23.	125	43	Very weak	3½	Bearded	4,800	35	..	60	"
Dufferin	" 20.	122	41	Stiff	4	Beardless.	5,400	34	..	61	Badly.
Percy	" 18.	120	46	"	3½	"	4,800	33	40	60	None.
White Russian	" 23.	125	39	"	4	"	5,200	33	40	61	Slightly.
Stanley	" 24.	126	40	"	4	"	6,200	33	40	60	"
Huron	" 23.	125	36	Fair	3½	Bearded	5,000	33	40	60	"
Old Red River	" 24.	126	40	Stiff	4	Beardless.	5,900	33	..	61	"
Preston	" 23.	125	41	Fair	4	Bearded	4,600	32	20	60	"
Progress	" 18.	120	38	Stiff	3½	Beardless.	5,500	32	..	61	None.
Pringle's Champlain	" 24.	126	34	Weak	4	Bearded	4,600	32	..	61	Slightly.
Campbell's White Chaff	" 23.	125	39	Stiff	3	Beardless.	5,000	31	20	60	Considerably.
Red Fern	" 22.	124	40	Weak	3½	Bearded	5,200	31	..	58	"
Admiral	" 24.	126	35	Fair	3½	Beardless.	4,600	31	..	58	Slightly.
Vernon	" 23.	125	40	Weak	3½	Bearded	4,600	31	..	59	"
Beauty	" 23.	125	37	Stiff	4	Beardless.	4,800	30	20	60½	"
Blenheim	" 24.	126	41	Fair	3	Bearded	4,000	30	..	60	"
Rio Grande	" 25.	127	38	Stiff	4	Bearded	5,100	30	..	60	"
Golden Drop	" 23.	125	35	"	3	Beardless.	4,900	29	20	59½	"
Alpha	" 24.	126	34	Fair	3	"	4,200	27	20	61	"
Dion's	" 22.	124	40	Stiff	4½	Bearded	4,800	27	20	60	"
Herisson Bearded	" 24.	126	34	Weak	1½	"	4,400	27	..	59	"
Colorado	" 23.	125	43	"	3	"	4,600	26	40	61½	"
Emporium	" 25.	127	31	Stiff	4	"	4,600	26	20	59	None.
Dawn	" 18.	120	32	"	3½	Beardless.	3,900	25	40	62	Slightly.
Countess	" 22.	124	35	Weak	3	"	4,200	25	40	60	Badly.
Beaudry	" 20.	122	42	"	3	Bearded	4,300	25	..	60	"
Rideau White Chaff	" 22.	124	35	Stiff	3½	Beardless.	4,400	24	40	59	Slightly.
Blair	" 29.	131	37	Very weak	2½	Beardless.	4,200	24	40	59	None.
Advance	" 24.	126	33	Fair	3	Bearded	2,600	23	40	61	Slightly.
Captor	" 28.	130	44	Stiff	3½	Beardless.	4,400	22	20	60	"
Black Sea	" 23.	125	39	Fair	3½	Bearded	3,300	21	..	58	Badly.
Ladoga	" 22.	124	34	Weak	3½	"	2,800	20	20	59	"
Mason	" 23.	125	30	"	2	Beardless.	3,200	20	.	60	Considerably.
Plumper	" 15.	117	33	Stiff	3	Bearded	3,200	20	..	59	"
Harold	" 18.	120	28	"	2½	"	3,800	18	40	58	Slightly.

Average Results from a Five Years' Test of Wheat.

Only by repeated tests continued through varying seasons can we expect to reach correct conclusions.

For this reason a summary is given of the test of varieties of wheat for four and five years.

Name of Variety.	Years Included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	Lbs.	
White Fife	1894-95-96-97-98	37	28	120
Red Fife	1894-95-96-97-98	35	28	120
Preston	1894-95- -97-98	34	22	119
Rio Grande	1894-95-96-97-98	33	50	117
Monarch	1894-95-96-97-98	33	30	120
Crown	1894-95-96-97-98	33	18	115
Pringle's Champlain	1894-95-96-97-98	33	2	117
White Connell	1894-95-96-97-98	33	..	119
Wellman's Fife	1894-95-96-97-98	31	46	120
White Russian	1894-95-96-97-98	31	40	118
Old Red River	1894-95-96-97-98	31	24	119
Percy	1894-95-96-97-68	31	6	115
Red Fern	1894-95-96-97-98	31	4	119
Advance	1894-95-96-97-98	30	44	116
Stanley	1894-95-96-97-98	30	26	116
Campbell's White Chaff	1894-95-96-97-98	30	6	117
Herisson Bearded	1894-95-96-97-98	29	56	117
Blenheim	1894-95-96-97-68	29	28	116
Dion's	1894-95-96-97-98	29	18	120
Emporium	1894-95-96-97-98	28	38	118
Huron	1894- -96-97-98	26	2	112
Captor	1894-95-96-97-98	25	44	119
Ladoga	1894-95-96-97-98	25	38	114
Black Sea	1894-95-96-97-98	24	38	113
Colorado	1894-95-96-97-98	23	18	114

Field Plots of Wheat.

These were all sown on summer-fallowed land excepting the two acres of Red Fife, which was sown on backsetting.

Name of Variety.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Yield per Acre.	
		Acres.				Inches.	Bush.	Lbs.
Wellman's Fife	Sandy loam.	$1\frac{1}{4}$	April 14	Aug. 12	120	40	40	..
Red Fife	Clay "	2	" 27	" 26	121	42	39	30
Preston	Sandy loam.	3	" 14	" 10	118	40	36	..
Percy	"	2	" 15	" 15	122	42	31	30
Red Fife	"	$3\frac{1}{2}$	" 18	" 26	130	35	30	40
White Connell	"	$3\frac{1}{2}$	" 13	" 10	117	39	30	8
Monarch	"	$1\frac{3}{4}$	" 15	" 15	122	40	27	..
White Fife	"	$3\frac{1}{2}$	" 13	" 11	118	37	20	34
Crown	Clay loam	1	" 22	" 19	119	45	38	18
White Russian	"	1	" 22	" 21	121	43	37	43
Dufferin	"	1	" 22	" 21	121	44	34	28
Vernon	"	1	" 22	" 18	118	41	33	30
Blenheim	"	1	" 22	" 18	118	43	32	54
Alpha	"	1	" 22	" 19	119	43	31	35
Admiral	"	1	" 22	" 21	121	41	30	54
Hungarian	"	1	" 22	" 20	120	37	29	8
Rio Grande	"	1	" 22	" 19	119	43	26	19
Ladoga	"	1	" 22	" 19	119	36	24	58

Wheat after a Clover Crop.

In the eastern provinces clover has become an important factor in crop rotations, but very little is known regarding its effects in this country.

A plot of land which had been in Sweet Clover for two years, was ploughed last spring and sown with Red Fife. For comparison two adjoining plots one which had been summer-fallowed the previous year and another of wheat stubble, were sown about the same time.

The yield on the land on which the sweet clover was grown, exceeded that from wheat stubble, but was not equal to the summer-fallowed land. The plots were $\frac{1}{20}$ acre each and the soil a rich sandy loam.

How Treated.	Sown.	Ripe.	Character of Straw.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bush.
				Lbs.	Bush.	Lbs.	Lbs.
Summer-fallowed.........	May 5....	Aug. 25....	Weak	7,600	44	..	61
Sweet clover land.........	" 5....	" 24....	Stiff..	6,200	38	..	62
Wheat stubble............	April 19....	" 15....	"	4,100	27	50	60

The Rolling of Land for a Wheat Crop.

One of the objections to the rolling of land in this country after sowing grain is the tendency that finely pulverized soil has to drift with severe wind storms during the spring months, some think that the injury is lessened when the rolling is done before sowing. Owing to an absence of severe storms this year, this point could not be fairly tested.

It will be noticed, however, that rolling in each instance gave enough increase in yield to pay for the extra work, this agrees with the results obtained here from a similar experiment during 1894.

The tests were made on plots of $\frac{1}{20}$ acre, soil sandy loam, and the sowing done with a shoe drill.

The field had been summer-fallowed the previous year. There was no rust on these plots.

Name of Variety.	How treated.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Red Fife.........	Not rolled	May 5..	Aug. 28..	115	40	Stiff..	3	5,700	32	..	61
"	Rolled before sowing	" ..	" ..	115	41	" ..	3½	6,000	33	20	60½
"	" after "	" ..	" ..	115	42	" ..	3½	5,600	33	40	62

Test of Drills for Sowing Wheat.

Each year as the soil on the older fields becomes more finely pulverized, the advantage of drill sowing over broadcast is more apparent.

This year the germination of the broadcast sown grain was delayed so much that the crop was badly frozen by fall frosts, injuring the sample and reducing both the yield and weight per bushel.

The use of drills is now more general throughout the province, but there are a few farmers who still adhere to broadcast sowing, which results in a loss of a considerable percentage of their crop.

The size of the plots was $\frac{1}{20}$ acre each, the soil a sandy loam, which had been summer-fallowed. There was no rust on these plots.

Name of Variety.	Drill used.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Red Fife	Hoe drill	April 30..	Aug. 28..	120	40	Stiff	3½	4,200	24	40	62
"	Shoe "	" 30..	" 26..	118	40	"	3	4,000	21	40	61½
"	Broadcast	" 30..	Sept. 10..	133	40	"	3	3,300	14	40	59

Varying Quantities of Seed for Wheat.

In these experiments five pecks of seed gave the best return during the past season, this is from one to two pecks less than is generally used here.

The size of plots in this test was one-twentieth acre. The soil was a rich, sandy loam, and a hoe drill was used for sowing. The field was summer-fallowed. There was no rust on any of these plots.

Name of Variety.	Seed per Acre.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Red Fife	4 pecks	April 30..	Aug. 28..	120	46	Stiff	3½	5,000	25	40	59½
"	5 "	" 30..	" 28..	120	42	"	3	3,900	26	40	60
"	6 "	" 30..	" 28..	120	42	"	3	4,300	23	40	60½

Preventives of Smut in Wheat.

Two different classes of wheat were treated with bluestone this year.

The one called "clean" seed had no appearance of smut, but evidently there was sufficient spores to affect the produce.

The other sample was so badly affected with smut that only a very careless person would think of using it for seed. Red Fife was the variety used in each case.

Although bluestone has in most seasons effectively prevented smut, even where the seed was badly affected, the experience of this year would indicate that smutty seed should not be sown, and that apparently clean seed should be treated to secure freedom from smut. The seed in this test was treated with bluestone prepared by dissolving 1 lb of the bluestone in 3 gallons of water and sprinkling this on the wheat before sowing.

The land was summer-fallowed for this test. The size of the plots was $\frac{1}{20}$ acre each, and the soil was a sandy loam. The plots were all sown on the 30th of April.

—	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Good Heads.	Smutty Heads.
				In.	In.	Lbs.	Bush.	Lbs.	Lbs.		
Clean seed treated	April 30..	Aug. 27..	119	43	4	5,800	32	..	61	468	....
" not treated	" 30..	" 27..	119	44	4	5,800	32	40	60	312	9
Smutty seed treated.	" 30..	" 27..	119	45	4	6,200	33	20	61	325	40
" not treated......	" 30..	" 27..	119	44	4	5,400	27	40	51	190	151

Different Ways of Preparing Land for Wheat.

The best returns were obtained after pease. This is in accordance with the experience of former years, and is a strong argument in favour of the more extensive cultivation of this crop.

The comparative small yield after flax agrees with the general experience of farmers in this province.

The results from spring and fall ploughing also agrees with the experience gained in former seasons. Spring ploughing appears to be the most advantageous, but unfortunately there does not appear to be sufficient time for the farmer to prepare all his wheat land in the spring, and a portion has necessarily to be ploughed in the fall.

All the plots in this test were sown on 19th April, the size of the plots was $\frac{1}{20}$ acre each and the soil a clay loam.

Wheat.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
How Prepared.			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
After pease....	Aug. 24...	127	44	Stiff..	4	Beardless.	7,200	43	20	62½
Summer-fallow..................	" 24...	127	41	"	4	" ..	7,000	40	5	61
After flax.	" 26...	129	33	"	3½	"	5,000	32	40	60
Unburnt wheat stubble...........	" 18...	121	44	"	4	"	6,400	36	20	62
Burnt wheat stubble..............	" 18...	121	45	"	4	"	6,350	35	..	62½
Disc-harrowed burnt stubble.	" 24...	127	44	"	4	"	6,700	33	10	62
" unburnt stubble....	" 24...	127	43	"	4	"	6,400	31	20	61
Spring ploughed..................	" 18...	121	41	"	4	"	5,300	35	..	61½
Fall ploughed..	" 13...	116	37	"	3½	"	4,600	31	10	62

Results of Early, Medium, and Late Sowings.

This series of experiments has been continued this year with results more than usually instructive.

The returns of wheat were remarkably uniform. In every instance the earliest sown wheat gave the largest crop, the yield gradually growing less from week to week until the small returns of 14⅓ and 16⅔ bushels were reached. The difference between the earliest and latest sown Red Fife was 28⅔ bushels per acre, and with the Stanley wheat 20⅓ bushels.

In nearly every instance the weight per bushel also diminished each week, the difference in Red Fife being 11½ pounds per bushel and in Stanley 13 pounds.

The two first sowings of each variety were only slightly injured by rust, while the later sown plots were seriously affected.

The last sown plot of each variety was injured by fall frost.

The land for this test was summer-followed, the size of the plots was $\frac{1}{20}$ acre each, the soil a rich black sandy loam.

WHEAT—Early, medium and late sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
Red Fife........	Apl. 23..	Aug. 24..	123	44	Stiff..	4	5,200	45	20	61½	Slightly.
"	" 30..	" 27..	119	41	"	4	7,800	34	20	62½	"
"	May 7..	Sept. 2..	118	47	"	4	6,500	30	40	60	Considerably.
"	" 14..	" 7..	116	46	"	4	6,700	31	..	59	"
"	" 21..	" 8..	110	49	"	4	7,400	29	..	58	Badly.
"	" 28..	" 9..	104	45	"	3	5,800	16	40	51	"
Stanley	Apl. 23..	Aug. 22..	121	49	"	4	6,200	34	40	62	Slightly.
"	" 30..	" 25..	117	44	"	3½	7,000	32	40	62	"
"	May 7..	" 28..	113	46	"	4	6,200	31	40	60	Considerably.
"	" 14..	Sept. 1..	110	47	"	4	6,400	30	20	59	Badly.
"	" 21..	" 2.	104	49	"	3	5,200	20	20	59	"
"	" 28..	" 9..	104	47	"	4	3,100	14	20	49	"

OATS: EARLY, MEDIUM AND LATE SOWINGS.

The results with oats were also fairly uniform, but the second sown plot gave the largest return with both varieties, this agrees with the experience had in former years.

The difference in yield between the second and the last sown plots of Abundance oats was 50 bushels per acre, and with Banner 58 bushels, a very strong argument in favour of early sowing. The quality of the grain from the last sown plot was very inferior and light in weight.

The size of the plots was $\frac{1}{20}$ acre each, and the soil a rich black loam, which had been summer-fallowed.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
Abundance.......	Apl. 23..	Aug. 22..	121	50	Medium	8	8,500	101	6	37	Badly.
"	" 30..	" 24..	116	46	"	8	7,900	107	2	36	"
"	May 7..	" 27..	112	47	"	9	7,900	90	20	35	"
"	" 14..	Sept. 1..	110	49	"	7	6,100	73	18	34	Very badly.
"	" 21..	" 4..	106	50	"	8	7,000	69	14	33	"
"	" 28..	" 8..	103	51	"	8	5,000	57	2	28	"
Banner..........	Apl. 23..	Aug. 15..	114	49	Stiff....	7	7,400	98	28	37½	No rust.
"	" 30..	" 24..	116	49	"	7	8,500	119	14	40	Slightly.
"	May 7..	" 26..	111	52	"	8	8,400	117	22	37	Badly.
"	" 14..	Sept. 1..	110	56	"	10	7,000	84	24	37	"
"	" 21..	" 6..	108	56	"	10	7,500	75	10	34	Very badly.
"	" 28..	" 9..	104	56	"	10	6,200	61	26	32	"

BARLEY: EARLY, MEDIUM AND LATE SOWINGS.

With barley the advantage of early sowing was not so apparent as with the other grains noted, and it would appear that this cereal can be sown in this climate later than either wheat or oats, without much loss.

The size of the plots was $\frac{1}{20}$ acre each, and the soil a rich black loam, which had been summer-fallowed.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.	In.		Lbs.	Bush.	Lbs.	Lbs	
Odessa	April 23	Aug. 10	109	37	3	6-rowed.	6,400	67	4	49	Slightly.
"	" 30	" 13	105	37	3	" .	5,700	64	8	48	"
"	May 7	" 15	100	29	3	" .	6,000	63	36	48	"
"	" 14	" 20	98	37	2½	" .	6,100	64	28	49	"
"	" 21	" 24	95	39	2½	" .	6,400	64	28	48	Badly.
"	" 28	" 27	91	35	2½	" .	5,700	60	..	47	Very badly.
Canadian Thorpe	April 23	" 10	109	42	4	2-rowed.	5,800	63	36	51	None.
"	" 30	" 11	103	43	4½	" .	7,100	66	12	52	"
"	May 7	" 14	99	43	3	" .	6,900	57	4	50	"
"	" 14	" 24	102	44	3	" .	7,000	58	36	50	Slightly.
"	" 21	" 26	97	42	3	" .	6,700	56	32	49	Badly.
"	" 28	Sept. 2	97	36	3½	" .	6,300	47	24	49	Very badly.

Pease: Early, Medium and Late Sowings.

Usually early sown pease give the best returns, but this year the third and fourth sowings have produced the largest yields. This result can be attributed to the fact that the spring rains came much later than usual.

The size of the plots for this test was $\frac{1}{20}$ acre, the soil a rich black loam which had been summer-fallowed.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.		Bush.	Lbs.	Lbs.
Golden Vine	April 23..	Aug. 25..	124	43	2	Small.....	46	40	65
"	" 30..	Sept. 2..	125	60	2	"	46	..	65
"	May 7..	" 7..	123	50	2	"	51	20	65
"	" 14..	" 10..	119	48	2	"	50	20	65
"	" 21..	" 16..	118	50	2½	"	42	20	65
"	" 28..	" 20..	115	52	2½	"	40	..	64
Mummy	April 23..	Aug. 23..	122	44	3	Medium..	49	20	64
"	" 30..	" 26..	118	39	2	" ..	49	..	63½
"	May 7..	Sept. 2..	118	44	2	" ..	49	20	64
"	" 14..	" 8..	117	47	2½	" ..	53	..	64
"	" 21..	" 13..	115	48	2½	" ..	52	..	65
"	" 28..	" 16..	111	51	2	" ..	37	40	60

EXPERIMENTS WITH OATS.

The importance of this cereal for feed to the farmers of Manitoba should result in greater care in the preparation of land for this crop.

The very general plan of sowing a field with wheat as long as it will bear a crop and following this with oats may prove fairly successful in a year of heavy rainfall, but will surely lead to disappointment in a dry season.

As a rule in Western Manitoba no more than two crops of wheat in succession should be grown after a fallow, and on some soils one crop of wheat followed by oats or barley will be found the most profitable.

The past season has been a very favourable one for oats and the yield on all parts of the experimental farm has been unusually large and the quality excellent.

American Beauty is an excellent variety of white oats which has been very productive on this farm.

California Prolific Black was among the ten most productive sorts in 1897, and has again given good returns in 1898.

Bavarian has also proved very productive on large fields as well as in plots, this year.

Mennonite is maintaining its reputation as one of the best yielding varieties here, but its yellow colour is often objected to. This variety was imported by the Mennonites from Russia some years ago and received from them the name of Russian oat.

Oxford and Pense are both cross-bred white varieties with half-sided heads and bright stiff straw.

The large yield of 106 bushels of Banner Oats show that this is still one of the best sorts for general cultivation in this province.

To prevent smut the seed of all the varieties was immersed for five minutes in a liquid composed of one pound of bluestone dissolved in three pails of water.

Seven of those so treated were considerably affected with smut and four slightly so, the remainder were quite free from this disease.

These tests were made on plots of $\frac{1}{20}$ acre, the soil was sandy loam summer-fallowed, two bushels of seed was used per acre sown with a shoe drill and all the plots were sown on the 30th of April.

OATS.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			Ins.		Ins.		Lbs.	Bush.	Lbs.	Lbs.	
White Giant	Aug. 26.	118	78	Stiff	9	Branching	7,900	114	4	40	None.
American Beauty	" 24.	116	51	Fair	8	"	.....	113	18	39½	"
California Prolific Black	" 25.	117	55	Stiff	9	Sided	8,300	110		36	Slightly.
Bavarian	" 26.	118	57	"	10	Branching	8,000	109	14	39½	"
Mennonite	" 25.	117	48	Fair	9	"	7,800	108	28	40	"
Oxford	" 26.	118	54	Stiff	10	Half-sided	8,800	106	16	39¼	"
Pense	" 25.	117	56	"	10	"	8,700	106	16	38	"
Banner	" 25.	117	47	Fair	10	Branching	8,240	106	6	39	"
American Triumph	" 25.	117	48	"	9	"	6,800	105	30	40	None.
Thousand Dollar	" 19.	111	51	Very stiff	9	"	8,400	104	4	43	"
White Schonen	" 27.	119	47	Stiff	7	"	8,000	104	4	38	Slightly.
New Electric	" 19.	111	48	"	7	"	7,200	103	18	40½	None.
Newmarket	" 26.	118	45	Fair	7	"	7,500	99	14	40	Considerably.
Danish Island	" 25.	117	54	Stiff	8	"	.....	99	14	38	None.
Golden Tartarian	" 25.	117	43	"	9	Sided	7,600	98	28	33	Slightly.
Olive	" 25.	117	50	"	10	Half-sided	8,800	98	28	38	"
Improved American	" 26.	118	41	"	11	Branching	8,500	98	28	38½	"
Early Golden Prolific	" 24.	116	49	Weak	9	"	7,800	97	22	37	"
Oderbruch	" 25.	117	46	Fair	9	Half-sided	8,000	97	2	36¼	Badly.
Buckbee's Illinois	" 26.	118	44	Stiff	8	Branching	7,300	97	2	38	Slightly.
Holland	" 29	121	44	"	7	Sided	7,300	94	24	32½	Very badly.
Prolific Black Tartarian	" 25.	117	49	"	9	"	7,500	94	24	36½	Slightly.
Wallis	" 26.	118	48	"	7	Branching	7,900	94	4	39	"
Abundance	" 19.	111	37	"	8	"	8,000	94	4	37	"
Great White Maine	" 25.	117	39	Weak	10	Sided	7,300	94	4	37	Very badly.
Lincoln	" 24.	116	50	Fair	7	Branching	6,700	94	4	38¼	Considerably.
Cromwell	" 26.	118	54	Stiff	11	" "	7,900	93	18	38½	Slightly.
Holstein Prolific	" 28.	120	50	Fair	10	"	7,500	93	18	38	"
Hazlett's Seizure	" 26.	118	50	Weak	8	"	7,800	93	18	41½	Badly.
Potato Oats	" 24.	116	47	Fair	9	"	7,800	93	18	42	None.
Golden Beauty	" 19.	111	47	Stiff	8	"	6,500	93	18	39	Slightly.
Abyssinia	" 26.	118	50	"	9	Half-sided	8,200	92	32	37½	Badly.

Oats—Test of Varieties—*Concluded.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			Ins.		Ins.		Lbs.	Bush.	Lbs.	Lbs.	
Welcome..	Aug. 19.	111	56	Fair	11	Branching	7,800	92	32	43	Slightly.
Early Archangel	" 19.	111	45	Stiff	9	" .	7,100	92	32	40½	"
Pearce's Black Beauty	" 25.	117	42	Weak	9	" .	7,000	91	26	37	"
Columbus	" 24.	116	44	Fair	8	" .	8,400	91	6	3	Badly.
Excelsior	" 15.	107	41	Stiff	6	" .	5,500	90		38	Slightly.
Victoria Prize	" 19.	111	51	Weak	10	" .	6,700	89	14	44½	Considerably.
Dawsen	" 19.	111	54	Fair	8	" .	5.800	88	8	43	Slightly.
Siberian O. A. C	" 28.	120	49	Weak	10	" .	6,700	88	8	37	Considerably.
White Russian	" 25.	117	50	Fair	9	" .	7,500	87	22	39	"
Joanette	" 25.	117	41	Weak	9	" .	....	87	22	37	Slightly.
Improved Ligowo	" 24.	116	45	Stiff	6	" .	6,100	87	2	38	"
Master	" 24.	116	53	"	12	Half-sided	7,200	87	2	36	"
Golden Giant	" 28.	120	51	"	10	Sided.....	7,700	87	2	32	Very badly.
Russell	" 24.	116	50	Weak	8	Half-branching	7,300	86	16	38½	"
Early Blossom	" 27.	119	47	Stiff	8	Half-sided	7,900	85	30	33	"
Flying Scotchman	" 12.	104	48	"	12	Branching	6.200	85	10	41	None.
Early Maine	" 28.	120	56	Fair	10	" .	6,500	84	24	38	Considerably.
Cream Egyptian	" 19.	111	64	Stiff	8	Half-sided	6,800	84	24	40½	Slightly.
Miller	" 28.	120	56	Fair	11	Branching	7,900	84	4	38	"
Imported Irish	" 15.	107	49	"	9	" .	6,600	83	18	43½	Badly.
Rosedale	" 19.	111	50	"	9	Half-sided	6,900	82	32	40¾	Very badly.
Wide Awake	" 19.	111	46	"	7	Branching	6,100	82	32	40	Slightly.
King	" 19.	111	40	"	7	" .	6,800	79	14	40	None.
Prize Cluster	" 19.	111	44	Weak	10	" .	5,600	78	28	42	Badly.
Improved American	" 25.	117	46	"	10	" .	7,500	78	28	38	"
Bonanza	" 12.	104	40	Stiff	8	" .	6,900	78	28	44	None.
Brandon	" 27.	119	56	"	9	Half-sided	7,900	78	8	36¼	Slightly.
Mortgage Lifter	" 25.	117	44	Very weak	8	Branching	5,400	77	22	42	Badly.
Scottish Chief	" 12.	104	41	Weak	9	" .	6,900	77	22	43	Slightly.
Medal	" 28.	120	57	"	11	Half-sided	5,800	77	2	38	Considerably.
Winter Grey	" 19.	111	47	Stiff	9	Branching	6,100	75	30	39	"
Coulommiers	Sept. 1.	124	46	Fair	9	" .	8,300	75	10	35½	Slightly.
Poland	Aug. 19.	111	44	Stiff	8	" .	6,300	74	4	41½	Badly.
Early Gothland	" 26.	118	50	Weak	10	Half-sided	5,800	74	4	37½	"
Doncaster Prize	" 24.	116	47	Stiff	7	Branching	8,000	72	12	39	Slightly.
Dunn	" 26.	118	57	Fair	10	" .	7,700	67	2	37	"
Black Mesdag	" 22.	114	42	Fair	8	" .	5,800	65	10	38	Considerably.
Rennie's Prize White	" 24.	116	45	Stiff	7	" .	5,800	65	10	40	Slightly.
White Wonder	" 12.	104	42	"	9	" .	5,000	61	26	43½	None.
Scotch Hopetoun	Sept. 2.	125	48	"	9	" .	6,700	54	24	35	Very badly.

Average Results of Four and Five Years' Tests of Oats.

The accompanying table shows that the Banner Oat still takes the lead, and the difference in average productiveness of the several varieties is very marked.

The report for 1896 showed that the average return from Black Tartarian up to that date was 26 bushels per acre less than the Banner, and this year the difference is still over 20 bushels in favour of the Banner, and the Tartarian is seven days later in ripening.

Name of Variety.	Years Included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	Lbs.	
Banner	1893-94-95-96-98	93	12	107
American Beauty	1893- 95-96-98	92	19	112
Abundance	1893-94-95-96-98	82	26	106
Holstein Prolific	1893-94-95-96-98	80	..	107
Victoria Prize	1893- 95-96-98	78	3	105
White Russian	1893-94-95-96-98	75	28	109
Rosedale	1893-94-95-96-98	75	24	106
Golden Beauty	1893-94-95-96-98	75	4	110
Wide Awake	1893- 95-96-98	74	24	113
Abyssinia	1893-94-95-96-98	74	2	110
Early Archangel	1893-94-95-96-98	74	2	105
Improved Ligowo	1893-94-95-96-98	73	6	108
Black Tartarian	1893-94-95-96-98	70	32	114
Early Gothland	1893-94-95-96-98	69	11	109
Siberian	1893-94-95-96-98	67	30	115
Columbus	1893-94-95-96-98	65	30	108
Imported Irish	1893-94-95-96-98	65	4	101
American Triumph	1893-94-95-96-98	63	26	113
Welcome	1893-94-95-96-98	63	14	101

Oats.—Test of Varieties Sown on Spring Ploughed Stubble.

Many farmers contend that Banner Oats may possibly excel Black Tartarian on summer fallow ; but on spring ploughed stubble the Tartarian is the most productive. Last year these two varieties gave exactly the same yield on stubble land, but this year the Banner gave over 16 bushels per acre more than the Tartarian.

The Banner is not only a better milling oat but is more productive than the Tartarian.

The size of the plots used for this test was $\frac{1}{10}$ acre, the soil a clay loam and all were sown May 21st.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inches.	Lbs.	Bush.	Lbs.	Lbs.
Banner	Sept. 4	106	55	5250	68	8	38
Black Tartarian	" 7	109	47	5950	52	2	36
White Russian	" 3	105	49	4450	42	2	39

Field Plots of Oats.

These were all sown on summer-fallowed land, excepting the 10 acres of Banner which was sown on backsetting.

Name of Variety.	Date of Ripening.	Length of Straw.	Yield per Acre.	
		Inches.	Bush.	Lbs.
Banner	August 26..	50	75	
New Electric	" 21..	50	106	23
Columbus	" 21..	41	84	26
Prolific Black Tartarian	" 24..	40	70	17
Pearce's Black Beauty	" 21..	47	64	9
American Beauty	" 28..	46	110	2
Golden Giant	" 26..	47	96	16
Prize Cluster	" 19..	43	91	12
Wallis	" 30..	50	78	4
Siberian	" 21..	47	76	6
Russell	" 21..	42	74	

Oats and Pease Mixed for Grain.

For several years oats and pease mixed have been grown on this farm for fodder, but this year they were sown with the object of ripening the seed. With one exception the plots having the larger proportion of oats, gave the largest crop of grain.

The yields have been estimated on a basis of 40 lbs. per bushel.

The size of the plots in this test was $\frac{1}{20}$ acre and the land was summer-fallowed :—

Quantity of Seed per Acre.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
					Lbs.	Bush.	Lbs.	Lbs.
Oats, $2\frac{1}{2}$ bush. Pease, $\frac{1}{2}$ "	Rich sandy loam.	$\frac{1}{20}$ acre...	May 10...	Sept. 1....	6,500	68	20	38
Oats, 2 " Pease, $\frac{1}{2}$ "	"	" ...	" ...	" ...	7,300	70	00	40
Oats, $1\frac{3}{4}$ " Pease, $\frac{1}{4}$ "	"	" ...	" ...	" ...	6,500	67	20	37
Oats, $1\frac{1}{2}$ " Pease, $\frac{1}{2}$ "	"	" ...	" ...	" ...	7,000	65	00	38
Oats, 1 " Pease, 1 "	"	" ...	" ...	" ...	5,400	54	00	40

Formalin and Bordeaux Mixture as preventives of Smut in Oats.

While immersion in a weak solution of bluestone is useful in checking the spread of this disease, this treatment does not destroy all the spores in a badly affected sample, and some more efficacious remedy is desired.

For this experiment three varieties of very smutty oats were selected.

Two samples of each sort were treated with formalin ; one sample being steeped for two hours in a mixture composed of 3 oz of formalin to 10 Imperial gallons of water, equal to 2 to 1,000, and the other consisting $4\frac{1}{2}$ of formalin in 10 Imperial gallons of water or 3 to 1,000.

Bordeaux mixture (4 lb. lime, 4 lb. bluestone, in a barrel of water) was also used for this purpose, the seed being soaked for four hours in this preparation.

Check plots were sown with each variety of oat, untreated.

Each plot, was examined carefully and not a smutty head could be found on any part of the plots sown with seed soaked in the formalin solution for two hours.

FORMALIN and Bordeaux Mixture as Smut Preventives.

Name of Variety.	How Treated.	Good Heads.	Smutty Heads.
Mortgage Lifter	Not treated	249	29
Doncaster Prize	"	365	49
Flying Scotchman	"	392	52
Mortgage Lifter	Bordeaux mixture	298	8
Doncaster Prize	"	322	32
Flying Scotchman	"	295	9
Mortgage Lifter	3 ozs. formalin to 10 galls. water	386	0
Doncaster Prize	" "	265	0
Flying Scotchman	" "	298	0
Mortgage Lifter	4½ ozs. formalin to 10 galls. water	182	0
Doncaster Prize	" "	255	0
Flying Scotchman	" "	262	0

From the foregoing it would appear that the steeping of badly affected oats for two hours in a solution of formalin is a comple preventive of smut. But there are objections here to steeping grain for that length of time.

The quantity of seed used by each farmer is large, and the expense of providing vessels for this purpose is an important item. Further there are few facilities here for drying large quantities of grain and the time required is quite a consideration in the rush of spring work.

For these reasons it was thought advisable to try steeping in the Bordeaux mixture and formalin for shorter periods. The variety of oat used for this test was Doncaster Prize, a very smutty sample, grown on this farm in 1897. The sample used in the former trial was sent from Ottawa by the Director with the formalin and the instructions for using.

From the annexed table it will be noticed that the untreated sample gave about one half smutty heads, that the seed treated with Bordeaux mixture was very little better, but that the plots treated with formalin even for 5 minutes were quite free from smut ; it seems probable that a steeping for five or ten minutes may prove sufficient.

Should this prove sufficient, the time and expense required for the treatment of a large quantity will be much reduced, as the seed can be bagged at once and sown in a few hours without drying.

FORMALIN AND BORDEAUX MIXTURE as smut preventives,—grain steeped for short periods.

Variety of oats.	How Treated.	Time Steeped.	Good Heads.	Bad Heads.
Doncaster Prize	Untreated		163	142
"	Bordeaux Mixture	5 minutes	236	98
"	" "	10 "	175	100
"	Formalin "	5 "	291	0
"	" "	10 "	386	0
"	" "	30 "	325	0

The solution of formalin used in each of the above tests was made by mixing 4½ ounces of the formalin with 10 Imperial gallons of water.

Barley—Test of Varieties.

The season has been a favourable one for barley, and the yield averages higher than usual. The weight per bushel is in nearly every instance above the standard. The colour was, however, badly injured from excessive rains when in the sheaf.

The six-rowed varieties were stiffer in the straw than the two-rowed, about 66 per cent of the two-rowed being more or less lodged, while only 25 per cent of the six-rowed proved weak in the straw.

The size of the plots used for this test, was $\frac{1}{20}$ acre, the soil a sandy loam which had been summer-fallowed, and the plots were all sown on the 13th of May.

Barley, six-rowed.—Test of Varieties.

Name of Variety.	Date of ripening.	Number of Days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Stella	Aug. 24	103	37	Fair	3	7,800	68	16	53
Baxter	" 16	95	38	Weak	2½	6,200	63	36	53
Pioneer	" 19	98	41	Stiff	3	5,400	63	16	53½
Common	" 16	95	34	Weak	3	6,000	62	44	52
Trooper	" 23	102	34	Fair	3	6,400	62	44	52
Argyle	" 19	98	44	"	2	6,100	62	24	51
Oderbruch	" 15	94	41	Weak	2½	6,500	62	4	51½
Mansfield	" 16	95	41	Stiff	3	6,200	60	40	48
Rennie's Improved	" 15	94	41	Fair	2½	6,100	59	8	52
Surprise	" 24	103	36	Stiff	3	6,800	58	16	52¼
Summit	" 19	98	40	"	4	6,900	57	24	52½
Mensury	" 15	94	38	"	3	5,300	55	40	48
Royal	" 15	94	36	Very weak	2½	5,900	55	20	51
Phœnix	" 15	94	37	Stiff	2½	5,900	55	20	52¼
Empire	" 19	98	41	"	3	6,100	55	20	51¼
Petschora	" 15	94	32	Weak	3	5,400	54	8	50
Odessa	" 17	96	35	"	3	6,100	53	36	52
Nugent	" 19	98	45	Fair	2½	5,400	51	32	51
Vanguard	" 15	94	37	"	2	5,000	46	32	50
Excelsior	" 14	93	43	Stiff	3½	5,200	46	12	44½
Success	" 16	95	37	Fair	3	4,700	44	8	46
Champion	" 13	92	39	Stiff	3	4,200	37	24	45
Blue Barley	" 15	97	32	"	3	4,000	35	20	43¼

Barley, two-rowed.—Test of Varieties.

Name of Variety.	Date of ripening.	Number of Days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
Kirby	Aug. 24	103	38	Stiff	3	6,800	65	20	51½
Dunham	" 26	105	44	"	3	7,900	62	24	51½
French Chevalier	" 28	107	38	Very weak	4	6,600	57	44	51
Beaver	" 23	102	35	Weak	3	6,500	57	44	53
Leslie	" 25	104	30	Fair	3½	7,500	57	4	52
Thanet	" 28	107	38	Very weak	5	6,600	56	32	51½
Nepean	" 22	101	41	Stiff	3½	6,600	55	20	52
Logan	" 25	104	48	Very weak	3½	7,100	54	8	51
Newton	" 28	107	41	Fair	3	8,100	53	36	51
Kinver Chevalier	Sept. 3	113	39	Stiff	4	6,900	49	28	51
Sidney	Aug. 20	99	39	Very weak	3½	5,600	47	24	52¼
Victor	" 20	99	35	Weak	3	5,800	46	32	52
Prize Prolific	" 26	105	41	Very weak	4	6,900	46	12	50¼
Bolton	" 20	99	38	Weak	4	5,400	45	40	54
Pacer	" 22	101	39	"	3½	5,900	45	40	51½
Monck	" 24	103	43	Very weak	3	7,000	45	20	53
Canadian Thorpe	" 28	107	33	"	3	5,800	45	20	51¼
Danish Chevalier	" 28	107	33	"	4	4,800	37	4	51

Results of Tests with Barley from 1894 to 1898.

Name of Variety.	Years included.	Average Yield per Acre. Bush.	lbs.	Average Days Maturing.
Common	1894-95-96-97-98	51	26	89
Mensury	1894-95-96-97-98	50	22	92
Trooper	1894-95-96-97-98	49	18	94
French Chevalier	1894-95-96-97-98	47	12	98
Rennie's Improved	1894-95-96-97-98	44	46	90
Baxter	1894-95-96-97-98	44	19	91
Odessa	1894-95-96-97-98	44	2	92
Summit	1894-95-96-97-98	43	36	94
Surprise	1894-95-96-97-98	43	34	95
Phœnix	1894-95-96-97-98	43	20	90
Royal	1894-95-96-97-98	41	44	91
Petschora	1894-95-96-97-98	41	34	91
Oderbruch	1894-95-96-97-98	41	26	90
Thanet	1894-95-96-97-98	41	24	101
Beaver	1894-95-96-97-98	40	38	97
Newton	1894-95-96-97-98	39	38	100
Prize Prolific	1894-95-96-97-98	37	19	101
Canadian Thorpe	1894-95-96-97-88	36	44	102
Danish Chevalier	1894-95-96-97-98	34	32	101
Kinver Chevalier	1894-95-96-97-98	33	32	102

Field Plots of Barley.

Name of Variety.	Character of Soil.	Size of Plot.	Date of Ripening.	Length of Straw. Inches.	Preparation.	Yield per Acre. Bush.	Lbs.	Weight per Bushel. Lbs.
Mensury	Clay loam	2 acres	Aug. 25	40	Summer-fallow	67	24	48
Odessa	Sandy loam.	8 "	" 15	38	Backsetting	63	..	52

Pease—Test of Varieties.

The season has been a favourable one for this crop, and both yield and quality was good. Owing to the rain coming late in the season, many plants made a second growth, resulting in a large proportion of green pease in the sample. As better results seem to be obtained with pease on the Experimental Farm, than on the average farm of the province, a short description of the plan of growing pease here may prove instructive.

The strongest soil is selected for this crop, usually stiff clay loam. The field is well summer-fallowed the previous year, and is not harrowed in the spring before sowing. The grain is always sown as early as wheat, and with a drill, as deeply as possible, from $2\frac{1}{2}$ to $3\frac{1}{2}$ bushels of seed per acre is used, the larger the pea the more seed is required.

If the crop is to be cut with a binder, two pecks per acre of oats are sown with the pease.

The size of the plots for this test was $\frac{1}{20}$ acre, the soil a stiff clay loam, summer-fallowed, all the plots were sown either on the 24th or 29th of April.

Pease.—Test of Varieties.

Name of Variety.	Date of Sowing.		Date of Ripening.		Number of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield. Per Acre.		Weight per Bushel.
							Inch's	Inch's		Bush.	Lbs.	Lbs.
Harrison's Glory........	Apl.	24..	Aug.	13..	111	Weak...	32	3	Medium..	59	..	62½
Perth..	"	24..	"	29..	127	Rank...	37	3	" ..	55	40	63
Early Britain.....	"	29..	"	26.	119	Fair....	49	3	" ..	54	40	63
Pride............	"	24..	"	22..	120	" ...	39	3	" ..	54	40	64
French Canner....	"	29..	"	25 .	118	" ...	60	3	" ..	52	20	65
White Wonder..........	"	29 .	"	25..	118	" ...	35	3	" ..	51	..	64½
Vincent	"	29..	"	30..	123	Rank...	63	3	" ..	49	..	63½
New Potter..........	"	29..	"	31..	124	" ...	54	3	" ..	48	..	65
Black-Eyed Marrowfat..	"	24..	"	30..	128	" ...	60	3½	Large	48	..	64
Mummy.....	"	24..	"	25..	123	Fair.. ..	49	2½	Medium..	47	40	65
German White..........	"	29..	"	30..	123	Rank...	60	3	" ..	47	20	64
Ruby...................	"	29..	"	30..	123	" ...	60	3	" ..	46	40	63
Arthur............	"	24..	"	29..	127	Fair.. ..	42	3	" ..	46	..	65
Bruce..................	"	24..	Sept.	1..	130	" ...	44	2¾	Large	45	40	64
Fenton.......	"	29..	"	1..	125	Rank...	90	3	"	45	20	62½
Lanark.................	"	29..	"	1..	125	Fair.. ..	47	3	Medium..	45	..	63½
Alma.............	"	24..	"	1..	130	Rank...	53	2½	Large	44	40	65
Nelson	"	24..	Aug.	17..	115	" ...	46	2	Medium..	44	20	64
Picton..................	"	29..	"	30..	123	" ...	70	3	Small.....	43	40	65
King....	"	24..	"	23..	121	" ...	49	2½	Large	42	20	65½
Prussian Blue..........	"	29..	"	31..	124	" ...	62	2½	Medium..	42	..	65½
Kent....................	"	29..	Sept.	1..	125	Fair....	69	3	Large	41	20	63½
Carleton............	"	29..	"	1..	125	Rank...	72	2½	Medium..	41	..	65
Chancellor..............	"	24..	Aug.	13..	111	Weak...	47	2½	Small	40	20	63½
Large White Marrowfat.	"	24..	Sept.	4..	133	Rank...	62	3	Large	39	20	64
Mackay...	"	24..	"	3..	132	Fair.. ..	50	3	" ...	39	..	62
Elephant Blue..........	"	24..	Aug.	22..	120	" ...	25	3	Medium..	39	..	64
Archer	"	24..	Sept.	1..	130	" ...	60	2	Small.....	39	..	64
Victoria............	"	24..	"	1..	130	Rank...	58	2½	Large	39	..	63½
Canadian Beauty.......	"	24..	Aug.	30..	128	" ...	70	3½	Medium..	39	..	64
Macoun.................	"	24..	Sept.	2..	131	" ...	56	3	" ..	39	..	64
Multiplier....	"	24..	"	1..	130	" ...	59	2	Small.....	39	..	65
Yellow Pot Pease.......	"	29..	"	1..	125	Fair.. ..	32	2	"	39	..	67
Daniel O'Rourke........	"	29..	Aug.	24..	117	" ..	80	3½	Medium..	39	..	63
Cooper..................	"	29..	"	30..	123	" ..	60	3	Small.....	39	..	65½
Gregory............	"	29..	Sept.	6..	130	Rank...	70	2	Medium..	38	..	64
Trilby............	"	24..	"	1..	130	Fair.. ..	54	3	Large	37	20	64
Bright..................	"	24..	"	5..	134	" ...	55	3	Medium..	36	20	63
Prince Albert....	"	24..	"	6..	135	" ...	60	2	Small.....	36	..	62
Fergus..................	"	29..	"	10..	134	Rank...	67	2	"	35	..	63½
Paragon.................	"	24..	"	5..	134	Fair....	47	2½	Medium..	34	20	61½
Duke...............	"	24..	"	2..	131	Rank...	60	3	Large	34	..	62½
Bedford................	"	24..	"	3..	132	Fair.. ..	62	2	Medium..	33	20	63
Prince..................	"	24..	"	1..	130	" ...	42	3	Large	31	20	63½
Centennial..............	"	24..	Aug.	26..	124	" ...	60	3	"	31	20	62½
Agnes........	"	24..	"	30..	128	" ...	43	3½	Medium..	31	..	63
Crown...................	"	24..	"	13..	111	" ...	49	2	Small.....	28	40	65½
Oddfellow.............	"	24..	"	20..	118	" ...	57	2	Medium..	24	..	67
Creeper..........	"	24..	"	24..	122	Weak...	41	2	Small.....	23	20	62½

Average results from a five years test of Pease.

The variation in yield is not so great with different sorts of pease as with some other crops, still the difference of eight bushels per acre in the average yield of varieties for this period shown in the accompanying tables is worth considering. None of the new cross-bred sorts, some of which are very productive, have been long enough in cultivation here to be included in this list.

AVERAGE RESULTS FROM A FIVE YEARS TEST OF PEASE.

Name of Variety.	Years included.	Average Yield per Acre.		Average Days Maturing.
		Bush.	Lbs.	
Pride	1893-94-96-97-98	40	30	106
Mummy	1893-94-96-97-98	39	10	114
Potter	1893-94-96-97-98	38	54	117
Prince Albert	1893-94-96-97-98	36	38	120
Black-Eyed Marrowfat	1893-94-96-97-98	35	56	118
Crown	1893-94-96-97-98	35	33	105
Canadian Beauty	1893-94-96-97-98	34	2	119
Centennial	1893-94-96-97-98	33	42	118
Multiplier	1893-94-96-97-98	31	46	124

EXPERIMENTS WITH FLAX.

The yield of both flax seed and straw was abundant this year, but it was found difficult to secure the crop, especially where the sowing was late, and large quantities were still lying in the fields throughout the province when the first snow fell. On this farm the usual tests of thick and thin, and early and late sowings have been repeated.

The largest average yield of seed was obtained from the last sown plot, and the best return of pulled straw from the sowing of 21st May.

The thick sowings have given the largest average return of pulled straw and the smallest amount of seed.

All these plots were sown on rich black loam, which had been summer-fallowed, the size of the plots was $\frac{1}{20}$ of an acre.

Variety.	Amount of Seed Sown per Acre.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Date when pulled for Fibre.	Weight of Straw when pulled for Fibre, per Acre.	Yield of Seed per Acre.		Weight per Bushel.	Weight of Straw when Cut, per Acre.
	Lbs.				In.		Lbs.	Bush.	Lbs.	Lbs.	Lbs.
Flax	40	April 23	Aug. 20	119	29	Aug. 10	5,800	20	40	52	3,600
"	80	" 23	" 20	119	28	" 10	5,700	20	40	55	3,800
"	40	" 30	" 19	111	30	" 11	6,800	21	24	56	4,400
"	80	" 30	" 19	111	26	" 11	7,400	21	24	54	4,400
"	40	May 7	" 20	105	30	" 13	6,400	22	8	56	8,800
"	80	" 7	" 20	105	29	" 13	7,600	17	48	54	4,600
"	40	" 14	" 20	98	33	" 15	7,840	18	32	54	4,200
"	80	" 14	" 20	98	34	" 15	8,400	20	40	54	4,800
"	40	" 21	" 21	92	33	" 17	8,000	22	8	56	4,500
"	80	" 21	" 21	92	34	" 17	9,200	11	24	52	2,800
"	40	" 28	" 22	86	25	" 20	8,200	28	32	56	4,400
"	80	" 23	" 22	86	23	" 20	8,200	25	..	56	4,400

ROTATION PLOTS.

As yet very few farmers have any regular rotation in sowing their crops, but sooner or later some regular system suited to the requirements of the several districts, will need to be adopted. With a view of throwing some light on this subject, a number of plots on the Experimental Farm have for some years been devoted to this test. The accompanying table gives the results of four years work on this line, from which it will be seen that wheat alternated with roots or corn has given the largest money returns, but in this case the outlay was proportionately large.

The second plot in the list which was sown to wheat and oats on alternate years, shows a good return but the land has now become very weedy and the sample is badly mixed each year; from volunteer grain.

The plot sown with wheat continuously still gives a very fair yield, but the land is becoming more and more weedy each year. In every instance the summer-fallowed plots show the least number of weeds and should we have a succession of seasons with light rainfall, the yields on the fallowed land would be proportionately larger.

For comparison the price of wheat has been placed at 50 cents per bushel, oats 25 cents and barley 25 cents, turnips 5 cents per bushel and fodder corn at two dollars per ton.

All but the summer-fallowed land was ploughed in the spring.

The size of the plots in this test was $\frac{1}{10}$ acre, the soil an average sandy loam.

1895.			1896.			1897.			1898.			Total Value.
Crop.	Bush.	Value.	Crop.	Bush.	Value.	Crop.	Bush.	Value.	Crop.	Tons.	Value.	$ cts.
		$ cts.			$ cts.			$ cts.			$ cts.	
Wheat....	45·00	22 50	Turnips..	453·00	22 65	Wheat....	23·30	11 75	Corn......	22	44 00	100 90
										Bush.		
"	22·30	11 25	Oats......	83·28	20 95	"	13·10	6 58	Oats......	60·20	15 14	53 92
"	16·30	8 25	Wheat....	33·40	16 83	"	22·40	11 33	Wheat....	27·50	13 91	50 32
Barley....	38·26	9 63	"	28·30	14 25	Oats.. ...	35·00	8 75	Barley....	40·20	10 10	42 73
Fallow...............			"	34·10	17 08	Barley....	22·04	5 52	Oats......	64·24	16 17	38 77
"			"	28·50	14 41	Oats......	36·06	9 04	"	56·26	14 19	37 64
Wheat....	45·50	22 91	Fallow...............			Wheat....	27·50	13 91	Fallow..............			36 82
Fallow...............			Wheat....	36·40	18 33	Oats......	37·22	9 41	"			27 74

EXPERIMENTS WITH INDIAN CORN.

Although the early part of the season was unfavourable for the rapid growth of corn; the weather during July and August was all that could be desired for this crop, and the yield of nearly all varieties is above the average, frost also kept off sufficiently late to allow many of them to reach an advanced stage of maturity. Such rank growing sorts as Red Cob Ensilage and Cloud's Early Yellow reached the early milk stage, and many ears of North Dakota Flint were fully matured.

With but two exceptions the yield from rows exceeded that from hills, this agrees with the experience here in former years.

In addition to the varietal test of fodder Corn experiments were made in sowing at different distances apart. In two of the three varieties tried the largest yield was obtained from rows two feet apart; this is one-third closer than is generally recommended, such experiments need to be repeated for several years before any safe conclusion can be drawn from them. The corn also would probably be more mature in the wider rows.

Seven acres of North Dakota Flint corn was grown for ensilage, this field was spring ploughed wheat stubble. A considerable quantity of volunteer grain and weeds came up among the crop, but these were readily kept in check by harrowing every few days until the plants were three inches high. The one horse cultivator was then twice run lengthwise of the rows, followed each time by a clean hoeing between the plants, and the field by this means was kept quite free of weeds. The yield was 11 tons per acre of corn, which was cut on an average four days before weighing; this partial drying before putting it into the silo ensures an excellent quality of ensilage. If not partially wilted the ensilage is nearly always sour in this climate.

The soil was a rich black loam; all the varieties were sown on 23rd of May, and the yield per acre has been calculated from the weight of crop cut from two rows each 66 feet long.

The previous crop was potatoes.

Corn—Test of Varieties.

Name of Variety.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when Cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	In.							Tons.	Lbs.	Tons.	Lbs.
Thoroughbred White Flint	103	Very leafy	Aug. 22.	Aug. 28.	....	....	Silk	29	1,840	29	1,400
White Cap Yellow Dent	96	Few leaves	" 15.	Sept. 1.	....	....	"	28	1,200	23	1,520
Red Cob Ensilage	102	Fairly leafy.	" 20.	Aug. 23	Aug. 31.	....	Early milk	27	1,440	27	1,000
Cloud's Early Yellow	100	Few leaves	" 20.	" 22	Sept. 1.	....	"	27	1,000	23	200
Early Mastodon	105	"	" 20.	Sept. 1	....	....	Silk	27	120	24	1,500
Compton's Early	85	Fairly leafy.	" 6.	Aug. 20	Aug. 22.	Sept. 1.	Late milk	25	1,700	22	1,980
Pearce's Prolific	73	Leafy	" 6.	" 19.	" 28.	....	Early "	25	600	24	180
Giant Prolific Ensilage	108	Fairly leafy.	" 30.	....	....	....	In tassel	25	380	25	600
Early Butler	103	Few leaves	" 12.	Aug. 22.	Aug. 29.	....	Early milk	24	1,940	18	740
Angel of Midnight	81	Very leafy	" 8.	" 18.	" 29.	....	"	24	1,720	24	1,500
Pride of the North	90	"	" 15.	" 22.	" 30.	....	"	24	1,500	19	1,600
Mammoth 8-rowed Flint	96	Leafy	" 7.	" 20.	" 31.	....	"	24	840	21	680
Mitchell's Extra Early	74	Very leafy	July 25.	" 1.	" 15.	Aug. 22.	Late milk	23	1,300	21	240
Longfellow	89	Leafy	Aug. 8.	" 18.	" 28.	....	Early "	23	1,080	23	420
Extra Early Huron Dent	88	Fairly leafy.	" 6.	" 15.	" 22.	Sept. 1.	Late "	23	200	22	....
Sanford	80	Very "	" 14.	" 22.	" 30	....	Early "	23	200	22	....
North Dakota White	76	Leafy	" 6.	" 19.	" 24.	Aug. 31.	Late "	22	1,100	22	....
Champion White Pearl	100	Few leaves	" 20	" 30.	....	....	Silk	21	1,560	22	....
Canade White Flint	80	Very leafy	" 5.	" 15.	Aug. 29.	....	Early milk	21	1,200	20	1,800
Cuban Mammoth	110	Few leaves	" 13.	" 22.	" 30.	....	"	20	1,800	20	1,360
Selected Leaming	115	"	" 15.	Sept. 1.	....	....	Silk	19	1,160	17	1,640
King of the Earliest.	93	"	" 8.	Aug. 18.	Aug. 30.	....	Early milk	19	940	16	120
Ruby Mexican	82	Very leafy	" 15.	" 28.	....	....	Silk	19	720	19	280
Evergreen Sugar	77	Fairly "	" 12.	" 22.	Aug. 31.	....	Early milk	14	160	13	1,060

Indian Corn Sown at Different Distances Apart.

Vame of Variety.	Distance between Rows.	Size of Plot.	Date of Sowing.	Height.	Leafiness.	When cut.	Condition when cut.	Weight per acre grown in rows.	
				Inches.				Tons.	Lbs.
Selected Leaming	2 ft. apart.	2 rows	May 23.	75	Fairly leafy.	Sept. 2.	Silk	27	450
"	2½ "	"	"	70	"	"	"	22	880
"	3 "	"	"	79	"	"	"	23	640
"	3½ "	"	"	108	"	"	"	23	436
"	4 "	"	"	84	"	"	"	22	55
Champion White Pearl	2 "	"	"	73	"	"	"	29	80
" "	2½ "	"	"	74	"	"	"	22	352
" "	3 "	"	"	73	"	"	"	24	1,500
" "	3½ "	"	"	72	"	"	"	23	624
" "	4 "	"	"	78	"	"	"	21	1,065
Longfellow	2 "	"	"	62	"	"	"	22	550
"	2½ "	"	"	60	"	"	"	25	952
"	3 "	"	"	61	"	"	"	24	1,280
"	3½ "	"	"	65	"	"	"	22	180
"	4 "	"	"	68	"	"	Early milk	24	840

AVERAGE YIELD OF THE THREE VARIETIES TESTED.

	Tons.	Lbs.
Average weight from rows 2 feet apart..........	26	360
" " 2½	23	728
" " 3	24	473
" " 3½	22	1,746
" " 4	22	1,320

EXPERIMENTS WITH FIELD ROOTS.

The abundant rain-fall during the late summer and fall, was very beneficial to the field roots and produced a rapid growth of the plants.

The yield has been a phenomenal one, far exceeding any previous crop on this farm, and the quality excellent.

In addition to the usual test of varieties on fall ploughed land, duplicate plots were sown on summer-fallow, and in nearly every instance the returns from summer-fallow exceeded those from fall ploughing.

TURNIPS.

As usual here the Purple Top Swede has proved the most productive both on summer-fallow and fall ploughing ; this is also an excellent Swede for table use.

Hartley's Bronze is another variety which has grown a large crop, and both of these can be recommended for this province.

The soil was a rich sandy loam ; the estimate of yield has been made from the product of two rows each 66 feet long ; all were free of rot.

The first plots were sown on 17th May and the 2nd on 1st June in drills 30 inches apart ; all were pulled on 7th October.

The previous crop on the fall ploughed land was mangels.

TURNIPS—Test of Varieties on summer-fallow.

Name of Variety.	Character of Growth.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Purple Top Swede	Fair	45	288	1,504	48	57	1,104	1,918	24
Jumbo or Monarch	"	39	1,728	1,328	48	44	1,760	1,496	..
Shamrock Purple Top	"	39	672	1,311	12	35	1,808	1,196	48
Hartley's Bronze	"	38	1,616	1,293	36	42	480	1,408	..
Prize Purple Top	Rank	38	32	1,267	12	39	1,022	1,320	..
Pearce's Prize Winner	Fair	36	1,920	1,232	..	43	1,120	1,452	..
Giant King	"	34	1,696	1,161	36	40	256	1,337	36
Selected Champion	"	34	1,168	1,152	48	48	1,680	1,628	..
Perfection Swede	Rank	34	112	1,135	12	50	320	1,672	..
Carter's Elephant	Weak	33	528	1,108	48	31	1,360	1,056	..
Mammoth Clyde	Rank	33	528	1,108	48	34	640	1,144	..
Sutton's Champion	"	32	944	1,082	24	30	1,376	1,689	36
East Lothian	Fair	32	944	1,082	24	44	704	1,478	24
Hall's Westbury	Rank	31	1,888	1,064	48	40	1,840	1,364	..
Skirving's	Fair	31	1,888	1,064	48	44	1,760	1,496	..
Halewood's Bronze Top	Weak	31	304	1,038	24	39	1,200	1,320	..
Bangholm Selected	Fair	29	1,664	994	24	38	32	1,267	12
Drummond Purple Top	Rank	28	1,024	950	24	33	1,584	1,126	24
Marquis of Lorne	Fair	28	496	941	36	35	1,280	1,188	..

TURNIPS—Test of Varieties on fall ploughed land.

Purple Top Swede	Fair	31	304	1,038	24	19	1,864	664	24
Drummond Purple Top	Rank	29	872	981	12	34	904	1,148	24
Pearce's Prize Winner	Fair	24	840	814	..	18	960	616	..
Selected Champion	"	24	576	809	36	21	240	704	..
Prize Purple Top	Rank	23	1,256	787	36	20	1,712	695	12
Perfection Swede	"	23	992	783	12	20	1,184	686	24
Halewood's Bronze Top	Weak	22	1,408	756	48	20	1,184	686	24
Skirving's	Fair	21	1,032	717	12	17	1,904	598	24
East Lothian	"	21	1,032	717	12	24	1,104	818	24
Sutton's Champion	Rank	20	1,976	699	36	23	992	783	12
Hartley's Bronze	Fair	20	1,448	690	48	19	16	633	36
Mammoth Clyde	Rank	20	1,448	690	48	24	1,632	827	12
Bangholm Selected	Fair	20	1,448	690	48	24	1,896	831	36
Shamrock Purple Top	"	20	1,184	686	24	20	1,712	695	12
Marquis of Lorne	"	20	920	682	..	20	1,712	695	12
Giant King	"	19	16	633	36	18	696	611	36
Hall's Westbury	Rank	19	16	633	36	24	1,386	822	48
Jumbo or Monarch	Fair	18	168	602	48	17	1,904	598	24
Carter's Elephant	Weak	16	736	545	36	19	1,072	651	12

EXPERIMENTS WITH MANGELS.

This excellent field root can generally be depended upon to produce a paying crop here, it is less liable to injury from insect enemies than any of the other root crops, gives a larger yield per acre, and is prefered by milch cows, young cattle and swine.

The soil on which these roots were sown was a rich clay loam, and the estimate of yield has been made from the product of two rows each 66 feet long.

The first plot was sown on the 17th May, the second on the 1st June, in drills 30 inches apart; all were pulled on 4th October.

MANGELS—Test of Varieties on summer-fallow.

Name of Variety.	Character of Growth.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield. per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Giant Yellow Globe	Fair	57	1,104	1,918	24	53	392	1,773	12
Yellow Intermediate	Rank	55	880	1,848	..	65	416	2,173	36
Canadian Giant	"	53	656	1,777	36	60	1,440	2,024	..
New Giant Yellow Half Long	"	51	960	1,716	..	43	328	1,438	48
Gate Post	"	50	584	1,676	24	69	1,392	2,323	12
Mammoth Long Red	Fair	50	320	1,672	..	45	1,080	1,518	..
Norbiton Giant	Rank	48	1,416	1,623	36	41	1,952	1,399	12
Red Fleshed Tankard	Weak	46	400	1,540	..	Did not germinate.			
Giant Yellow Intermediate	Rank	45	1,608	1,526	48	56	992	1,883	12
Golden Fleshed Tankard	Weak	45	288	1,504	48	34	640	1,144	..
Giant Yellow Intermediate	Fair	44	1,710	1,496	..	Did not germinate.			
Prize Mammoth Long Red	Rank	44	176	1,469	36	49	1,792	1,663	12
Ward's Long Oval Shaped	Fair	42	1,536	1,425	36	44	707	1,478	24
Selected Mammoth Long Red	Rank	41	368	1,372	48	64	1,888	2,164	48
Oval Shaped Giant	Fair	40	256	1,337	36	Did not germinate.			
Gate Post, Yellow	"	38	1,880	1,298	..	55	880	1,848	..
Warden Orange Globe	Weak	30	1,512	1,025	12	45	1,872	1,531	12
Champion Yellow Globe	"	23	1,784	796	24	38	1,880	1,296	20

MANGELS—Test of Varieties on Fall Ploughing.

Gate Post	Rank	64	568	2,142	48	43	1,912	1,465	12
Yellow Intermediate	"	52	808	1,746	48	49	208	1,636	48
Norbiton Giant	"	52	808	1,746	48	34	1,432	1,157	12
New Giant Yellow Half Long	"	51	1,752	1,729	12	40	1,312	1,355	12
Giant Yellow Intermediate	"	48	1,152	1,619	12	43	1,120	1,452	..
Selected Mammoth Long Red	"	47	1,568	1,592	48	31	832	1,047	12
Canadian Giant	"	42	1,272	1,421	12	42	744	1,412	24
Giant Yellow Globe	Fair	42	1,008	1,416	48	53	1,184	1,786	24
Ward's Large Oval Shaped	"	40	1,048	1,350	48	22	1,408	756	48
Gate Post, Yellow	"	40	1,048	1,350	48	39	1,464	1,324	24
Mammoth Long Red	"	39	1,464	1,324	24	42	1,008	1,416	48
Golden Fleshed Tankard	Weak	38	32	1,267	12	38	560	1,276	..
Giant Yellow Intermediate	Fair	36	1,128	1,218	48	47	512	1,575	12
Oval Shaped Giant	"	29	872	981	12	Did not germinate.			
Prize Mammoth Long Red	Rank	29	344	972	24	51	960	1,716	..
Red Fleshed Tankard	Weak	28	1,288	954	48	27	912	915	12
Warden Orange Globe	"	21	1,296	721	36	34	904	1,148	24
Champion Yellow Globe	"	20	392	673	12	33	264	1,104	24

EXPERIMENTS WITH CARROTS.

Although duplicate plots of carrots were sown, as of the other field roots both on summer-fallow and fall ploughing the former suffered so badly through imperfect germination of the seed, that the returns would be quite misleading and hence are not given.

The soil of the fall ploughed field was a rich clay loam, the previous crop was mangels, and the estimate of yield has been made from the product of two rows each 66 feet long. The first plots were sown on 17th May, the second on 1st June, in drills 18 inches apart, and all were pulled on 11th October.

CARROTS.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
White Belgian	12	1,080	418	..	8	1,160	286	..
Iverson's Champion	12	200	403	20	9	1,360	322	40
Early Gem	12	200	403	20	11	1,760	396	..
Mammoth White Intermediate	12	200	403	20	12	640	410	40
Green-top White Orthe	11	1,320	388	40	9	40	300	40
Half-long White	11	880	381	20	11	1,760	396	..
Giant White Vosges	10	1,560	359	20	10	240	337	20
Half-long Chantenay	10	1,560	359	20	10	680	344	40
Ontario Champion	9	480	308	..	12	200	403	20
Scarlet Intermediate	9	40	300	40	8	720	278	40
Improved Short White	7	1,400	256	40	12	1,080	418	..
Guerande or Oxheart	7	960	249	20	8	1,600	293	20
Yellow Intermediate	6	1,640	227	20	8	1,600	293	20
Carter's Orange Giant	6	320	205	20	7	80	234	40
Long Orange or Surrey	Did not	germinate.			6	1,640	227	20
Long Scarlet Altringham	"	"			Did not	germinate.		

EXPERIMENTS WITH SUGAR BEETS.

The following are the yields obtained from six varieties of sugar beets sown at two different dates on rich clay loam both on summer-fallow and fall ploughed land.

The first plots were sown on the 17th May, the second on 1st June. All were pulled on 4th October, and the yield per acre has been calculated from the produce of one row 66 feet long.

SUGAR BEETS.—Test of Varieties on Summer-fallow.

Name of Variety.	Character of Growth.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Danish Red Top	Fair..	41	104	1,368	24	51	960	1,716	..
Wanzleben	Rank..	38	560	1,276	.	25	1,480	858	..
Danish Improved	"	34	1,696	1,161	36	39	144	1,302	24
Improved Imperial	Fair.	30	1,776	1,029	36	34	1,168	1,152	48
Red Top Sugar	"	30	1,776	1,029	36	36	1,920	1,232	..
Vilmorin's Improved	Rank..	26	1,328	888	48	31	1,361	1,056	..

SUGAR BEETS.—Test of Varieties on Fall Ploughing.

Danish Red Top	Fair..	49	736	1,645	36	Blown out; did not germinate.			
Danish Improved	Rank..	42	1,008	1,416	48				
Red Top Sugar	Fair.	31	568	1,042	48	34	112	1,135	12
Wanzleben	Rank..	30	1,248	1,020	48	45	816	1,513	36
Improved Imperial	Fair..	29	608	976	48	37	976	1,249	36
Vilmorin's Improved	Rank..	26	272	871	12	24	840	814	..

EXPERIMENTS WITH POTATOES.

The season has been a favourable one for a large yield of potatoes and the size of the tubers was uniformly large, but the quality is below the average, and many varieties usually of good quality are this year wet and poor in flavour; there were no rotten potatoes and very few scabby ones.

The land selected was in corn last year, and was ploughed deeply in the spring and well harrowed. It was again ploughed shallow on 16th May, and the tubers cut in pieces with 2 or 3 eyes each ; were planted a foot apart in every third furrow.

Very little hoeing was required, as weeds were kept down, principally with the harrow and cultivator.

The following varieties have proved among the most productive during the past two seasons ; Seedling No. 7, Late Puritan, Brown's Rot Proof, Dreer's Standard, and Chicago Market.

The following kinds germinated unevenly, and hence the returns given from them are not a fair test of their productiveness ; Early Rose, New Queen, Everett, Ohio Junior, Early Harvest, Lightning Express, Early Sunrise, Beauty of Hebron, Early Ohio, Burpee's Extra Early, Pearce's Extra Early and Honeoye Rose. Three of these same varieties germinated badly last year, nearly all of them are early maturing kinds. They may have been injured through excessive sprouting before the planting.

The yield per acre has been estimated in each case from the product of one row 66 feet long.

Practically all were marketable.

All the varieties were planted on 16th May in rich sandy loam soil, without manure, and were dug on 4th October.

POTATOES—Test of Varieties.

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Total Yield per Acre.		Form and Colour.
					Bush.	Lbs	
Seedling No. 7	Strong	Sept. 2	Large	Fair	682	..	Long flat, deep red.
Dreer's Standard	"	" 2	"	Wet	623	20	" round white.
I. X. L.	Fair	" 1	"	Fair	612	20	" " red.
Rural No. 2	"	" 1	"	Wet	608	40	Round flat, white.
State of Maine	Strong	" 4	"	Fair	601	20	Flat, white.
Brown's Rot Proof	"	" 6	"	Dry	590	20	Round oval, red.
Chicago Market	Fair	" 8	"	Fair	586	40	Flat oval, red.
Green Mountain	Strong	" 2	"	"	586	40	Long, white.
Quaker City	Very strong	" 4	"	Dry	586	40	Flat oval, white.
Late Puritan	Strong	" 2	"	Fair	579	20	Long, red.
Clay Rose	"	" 3	"	Wet	572	..	" flat, red.
Delaware	"	" 1	"	"	572	..	" " white.
Queen of the Valley	"	" 3	"	"	553	40	" " pink.
Great Divide	Fair	Aug. 24	"	"	550	..	" " white.
American Wonder	Strong	Sept. 6	"	Fair	550	..	Oval, white.
Columbus	"	" 1	"	Dry	539	..	Long round, red.
Carman No. 1	"	" 3	"	Fair	531	40	" " white.
Vanier	"	" 2	"	Wet	528	..	" pink.
Burnaby Seedling	"	" 2	"	Fair	520	40	" round, red.
Monroe County	Fair	" 1	"	Dry	513	20	" red.
American Giant	"	" 4	"	Fair	506	..	" white.
Money Maker	"	" 6	"	"	506	..	Round "
Hopeful	Strong	" 5	"	Wet	498	40	Long flat, white.
Clarke's No. 1	Fair	" 1	"	Fair	498	40	" pink.
Irish Daisy	"	" 2	"	"	498	40	Round, white.
Empire State	Strong	" 5	"	Wet	487	40	" "
Carman No. 3	Fair	" 1	"	"	484	..	Long flat, light yellow.
Maule's Thoroughbred	Strong	" 1	"	"	480	20	" pink.
Sir Walter Raleigh	Fair	" 6	"	Fair	476	40	Flat, white.
World's Fair	"	" 2	"	"	476	40	" "
Pride of the Market	Strong	Aug. 30	"	Dry	476	40	Kidney long, white.
Rural Blush	"	Sept. 3	"	Fair	476	40	Oval, red.
Polaris	Weak	" 1	"	Dry	476	40	Round, pink.
Freeman	Fair	" 1	"	Fair	465	40	Flat oval, white.
Rochester Rose	"	" 5	"	Wet	462	..	Long, pink.
Rose No. 9	Strong	" 6	"	"	458	20	Flat oval, red.
Wonder of the World	Fair	Aug. 23	"	Fair	447	20	Oval, red.
Good News	"	Sept. 6	"	Dry	443	40	Long round, pink.
Early Norther	"	" 3	"	Fair	440	..	Long, pink.

POTATOES—Test of Varieties.—*Continued.*

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
Charles Downing	Fair	Sept. 6	Large	Wet	440	..	Flat oval, white.
General Gordon	"	" 3	"	Fair	440	..	Long, red.
New Variety No. 1	Strong	" 1	"	Wet	440	..	Flat, white.
Early Puritan	Fair	" 5	"	"	436	20	Long, white.
Peerless, junior	Strong	" 5	"	"	432	40	Round "
Dakota Red	"	" 6	"	"	425	20	Long, red.
Irish Cobbler	Fair	Aug. 12	"	Fair	418	..	Flat round, white.
Record	Strong	Sept. 1	"	"	414	20	Long, white.
Uncle Sam	Fair	" 1	"	"	414	20	" "
Reeve's Rose	Strong	" 1	"	"	410	40	Round, red.
Lizzie's Pride	Fair	" 3	"	Wet	410	40	Flat oval, light red.
McKenzie	Strong	" 1	"	Fair	407	..	Long round, white.
Thorburn	Fair	Sept. 8	Medium	Wet	407	..	Oval, pink.
Maggie Murphy	Strong	" 1	Large	Dry	403	20	Long flat, light red.
Troy Seedling	Fair	" 1	"	Wet	403	20	Long, white.
Flemish Beauty	Strong	" 8	"	Dry	403	20	" red and white.
Reading Giant	Fair	" 1	"	Wet	396	..	Round oval, pink.
White Beauty	"	" 13	"	Dry	392	20	Long, white.
Stourbridge Glory	Strong	" 4	"	Fair	388	40	" "
Early White Prize	Weak	Aug. 20	"	"	385	..	Oval, light yellow.
Brownell's Winner	Strong	Sept. 1	"	Wet	385	..	Flat oval, red.
Table King	Fair	" 6	"	"	381	20	Round, white.
Vick's Extra Early	"	" 5	"	Fair	381	20	" light yellow.
Seattle	Strong	" 1	"	"	381	20	Long round, white.
Ideal	"	" 3	"	Wet	381	20	" red.
Seedling No. 230	Fair	" 8	"	"	381	20	Round, white.
Pride of the Table	"	" 1	"	Fair	377	40	Flat oval, pink.
Pearce's Prize Winner	"	" 1	"	Dry	374	..	" white.
Satisfaction	Strong	" 2	"	Fair	370	20	Long, white.
Northern Spy	Fair	" 6	"	Wet	366	40	" deep red.
Harbinger	"	" 2	"	Dry	344	40	Flat, pink.
Russell's Seedling	Strong	" 2	Medium	Wet	337	20	Round oval, white.
Algoma No. 1	Weak	Aug. 10	Large	Dry	330	..	Oval, pink.
Bovee	"	" 24	"	"	330	..	" light red.
Earliest of All	"	" 22	"	Fair	315	20	" "
Early Rose	Fair	" 22	"	"	315	20	" pink.
Holborn Abundance	"	Sept. 6	Medium	Wet	308	..	Round, white.
Victor Rose	"	Aug. 22	Large	"	308	..	Long flat, red.
Cambridge Russet	"	Sept. 2	Medium	"	300	40	" yellow.
Bill Nye	"	" 1	Large	"	297	..	" round, white.
Houlton Rose	"	" 6	"	"	297	..	" " light pink.
Early Six Weeks	Weak	Aug. 10	"	"	293	20	Round, pink.
Sharpe's Seedling	Fair	" 22	"	Fair	278	40	Oval "
Orphans	"	Sept. 3	"	Wet	278	40	Long, white.
New Queen	Weak	Aug. 24	"	Fair	256	40	Long round, pink.
King of the Roses	Fair	Sept. 1	"	Wet	253	..	Oval, light red.
Everett	"	" 1	"	Dry	249	20	Long, "
Ohio Junior	Weak	Aug. 15	"	Fair	242	..	Round, light pink.
Early Gem	"	" 14	Medium	"	242	..	Oval, red.
Early Harvest	"	" 23	Large	Dry	220	..	Long, white.
Lee's Favourite	"	" 22	"	Fair	220	..	Oval, light red.
Seedling No. 214	Fair	" 20	"	Wet	216	20	" white.
Hale's Champion	"	Sept. 3	"	Dry	212	40	Flat round, white.
Prize Taker	"	" 2	Medium	"	212	40	Round, deep red.
Lightning Express	"	" 6	Large	Very wet.	205	20	Long flat, pink.
Early Sunrise	Weak	Aug. 22	"	Wet	205	20	Round oval, pink.
London	Fair	" 24	"	Dry	198	..	Flat oval, red.
Fill Basket	"	Sept. 1	"	Wet	190	40	Long, deep pink.
Crown Jewel	Weak	" 2	Medium	Fair	190	40	Round, light red.
Daisy	"	" 1	Large	Dry	168	40	Round oval, red.
Beauty of Hebron	"	" 1	"	Fair	168	40	Long "
Early Andes	"	Aug. 15	"	"	154	..	Flat "
Early Ohio	"	" 15	"	"	154	..	Round, light rose.
Burpee's Extra Early	"	" 26	"	"	124	40	Oval, pink.
Pearce's Extra Early	"	Sept. 1	"	Dry	91	40	" light red.
Honeoye Rose	"	" 1	"	"	55	..	" " pink.

Grasses and Clovers.

The past season has confirmed previous results, with regard to the growing of grasses and clovers and added some fresh information on a few lines.

Many inquiries have been received in regard to the possibility of growing Brome grass on lands which are flooded for part of the year, and an experiment was tried to gain information on this subject.

A small area on the uplands on the experimental farm, about an acre is flooded from two to four feet deep each year, the water remaining on it until June. This was broken up during the summer of 1896, and sown to Brome grass without grain, a good stand was obtained and a magnificent crop of grass gathered this season, about 3 tons per acre, with a heavy aftermath. This experiment should be tried by farmers who have depressions on their land known here as pot holes, which are numerous in some parts of the province.

A three acre field of Brome grass broken up in August of 1896, and backset in October gave a fine crop of hay this year; the summer breaking apparently proving a benefit instead of killing the plants.

The five acre field of Brome grass ploughed thinly with a breaking plough, early in May, 1897, and backset before harvest, gave a good crop of wheat this year, and there are no signs of living grass plants, but the soil is full of dead roots for ten inches below the surface, and there will be no danger of this land drifting for some years.

Although the dry spring prevented a large return of hay this year, the series of plots sown with grasses were very uniform in character, and show that a fair yield can be obtained even in an unfavourable season. The plots were from $\frac{1}{10}$ to $\frac{1}{20}$ acre in size, and were divided into three series.

First,—A test of varieties sown in June on spring ploughed stubble.

Second,—The same varieties sown on summer-fallowed land in August.

Third,—A series of plots sown with varying amounts of seed.

All the plots were sown during 1896, and without a nurse crop of grain, all weeds and volunteer grain were mown twice during the first summer, and the ground in most cases was well covered with stout healthy plants by fall.

It will be noticed that grasses sown on summer-fallow which were so badly injured by winds last year, gave the best returns this year.

Last season the thick sowing of grass seed gave the largest average yield, while this year the best average is from thin sowing.

The Clovers have again wintered well, and have all given better returns than last year. Alfalfa takes the lead, as before, but Red Clover has improved wonderfully.

It would appear that past failures in growing clovers here may be largely attributed to sowing them with grain crops. The few surviving clover plants among a grain crop have usually very short roots, while this years Common Red Clover plants sown without a nurse crop, had roots eight inches long by fall, and the Alfalfa 16 inches.

Much larger areas were sown with clover last spring, and the ground is now covered with a healthy growth of plants.

Experiments with Grasses on Summer-Fallow.

Test of varieties sown in August, 1896. That year's crop was badly injured by drifting soil.

Variety.	Seed per Acre.	Weight per Acre, 1898.	
	Lbs.	Tons.	Lbs.
American Lyme Grass	20	3	1,000
Awnless Brome Grass	20	2	500
Timothy	15	2	500
Western Rye Grass	20	2	300
Timothy and Clover	10 + 10	2	300
Kentucky Blue	20	1	1,500
Meadow Fescue	30	1	1,100

EXPERIMENTS WITH GRASSES ON SPRING PLOUGHED STUBBLE.

TEST OF VARIETIES, SOWN IN JUNE, 1896.

Variety.	Seed per acre.	Thickness of Aftermath.	Weight per acre, 1897.		Weight per acre. 1898.	
	Lbs.		Tons.	Lbs.	Tons.	Lbs.
Western Rye Grass	20	Thin	3	750	1	1,100
Awnless Brome Grass	20	Very thick	3	400	1	1,300
American Lyme Grass	20	Thin	2	510	1	1,700
Bald Rye or Wheat Grass	20	Poor	2	200	1	1,600
Tall Meadow Oat Grass	30	Fair	1	400	1	300
Meadow Foxtail	20	Germinated badly	1	200	1	900
Hard Fescue	20	" "	1	200		1,300
Timothy	15	Thin	1	200	1	000
Orchard Grass	25	Very thick	1	50		1,900
Red Top	20	Fair	1	000		1,300
Timothy } mixed	10	"		750	1	500
Common Clover } mixed	10	"				
Meadow Fescue	30	"	....			1,800
Canadian Blue Grass	20	"	....			900
Drop seed	20	"	....		2	800

EXPERIMENTS WITH GRASSES.—Test of thick and thin seeding.

Variety.	Seed per Acre.	Weight per Acre, 1897.		Weight per Acre, 1898.	
	Lbs.	Tons.	Lbs.	Tons.	Lbs.
Timothy *(Phleum pratense)*	5	1	....	1	500
" "	10	1	670	1	200
" "	15	1	750		1,700
" "	20	1	700		1,800
Awnless Brome Grass *(Bromus inermis)*	10	2	350	1	1,100
" " "	15	2		1	900
" " "	20	2	400	1	700
Western Rye Grass *(Agropyrum tenerum)*	10	3	400	1	1,400
" " "	15	3	200	1	1,300
" " "	20	3	300	1	1,200
Bald Rye or Wheat Grass *(Elymus Virginicus)*	10	2	700	2	100
" " "	15	2	700	2	800
" " "	20	2	750	2	1,800
American Lyme Grass *(Elymus americanus)*	10	3		2	1,000
" " "	15	3	555	2	900
" " "	20	3	500	2	300
Drop Seed *(Muhlenbergia glomerata)*	10	....		3	1,800
" " "	15	....		3	800
" " "	20	....		2	1,600

Experiments with Clovers.

Test of varieties, sown in June, 1896, on spring ploughed stubble.

Variety.	Seed per Acre.	Aftermath thickness.	Yield per Acre, 1897.		Yield per Acre, 1898.	
	Lbs.		Tons.	Lbs.	Tons.	Lbs.
Alfalfa	60 lbs.	Thick	2	100	2	1,800
Red Clover	20	"	..	900	2	1,300
Alsike	10	Fair	1	100	1	1,200
Mammoth Red	25	"	1	500	1	1,200
White Dutch	12	"	Not cut		..	1,200

Grass Seed Distribution.

The demand for grass seed during the past season greatly exceeded the supply. Two hundred and twenty-six one-pound packages were sent out in the free distribution, and forty-seven lots of about fifteen pounds each were sold.

Experiments with Fodder Crops.

Early in the season, seed of Japanese Millet, Early Soja Beans and Horse Beans were received from the Director with instructions for sowing. The chief object in view in these tests was to gain information as to the relative usefulness of these plants for fodder purposes in this climate, and to ascertain the weight of crop obtainable from each when sown in different ways.

Japanese Millet.

This variety of Millet gave large crops and is quite promising.

The season was very favourable for millets, and the yield unusually large. Some of the plants were, however, quite coarse and woody in texture.

The size of each plot was $\frac{1}{20}$ acre; the soil a rich clay loam, and the land had been summer-fallowed the previous year. The seed did not ripen, although many heads were formed.

Yield of Japanese Millet Sown at Different Distances.

Variety.	Width of Drill.	Sown.	Length of Head.	Cut.	Height.	Yield per Acre, Dry Hay.	
						Tons.	Lbs.
Japanese Millet	9 inches	May 27	4 inches	Sept. 5	4 ft. 9 inches	5	1,400
"	12 "	" 27	4 "	" 5	4 " 9 "	6	400
"	Broadcast	" 27	4 "	" 5	4 " 9 "	5	1,200

Early Soja Beans.

This plant can probably be utilized as a soiling crop also for hay and ensilage. During the past season the Early Soja Beans have not proved as productive as horse beans here.

The land was summer-fallowed and harrowed in the spring before planting. The seed was sown with a garden drill and kept clean by the occasional use of a cultivator. The soil was clay loam.

The size of each plot was $\frac{1}{20}$ acre. There were only a very few plants with pods on, and the pods were only partly grown.

YIELD OF EARLY SOJA BEANS SOWN AT DIFFERENT DISTANCES.

Variety.	Rows.	Height.	Cut.	Yield per Acre, Green.	
				Tons.	Lbs.
Soja Beans	2 ft. apart	3 ft. 3 inches	Sept. 5	8	560
"	2½ "	3 " 3 "	" 5	8	320
"	3 "	3 " 3 "	" 5	7	1,400

HORSE BEANS.

The seed of this useful leguminous plant is utilized largely for horse feed in Europe. The plant can also be used for ensilage or for soiling purposes.

The land for this crop was summer-fallowed and harrowed in spring just before planting.

The seed was sown with a garden drill and kept clean by means of a cultivator; the soil was a rich clay loam. The beans were planted two inches apart in the row, on May 23rd.

The size of each plot was $\frac{1}{20}$ acre. The plants were well covered with pods, nearly all of which were filled with matured beans.

YIELD OF HORSE BEANS SOWN AT DIFFERENT DISTANCES.

Variety.	Rows.	Height.	Cut.	Yield per Acre, Green.	
				Tons.	Lbs.
Horse Beans	2 ft. apart	3 ft. 9 inches	Sept. 5	14	1,400
"	2½ "	3 " 9 "	" 5	15	760
"	3 "	3 " 9 "	" 5	15	1,400

SUMMARY OF CROPS GROWN ON THE BRANDON EXPERIMENTAL FARM DURING THE YEAR 1898.

—	Tons.	Lbs.	—	Bushels.	Lbs.
Fodder corn	163	....	Wheat	1,283	41
Oat sheaves	18	....	Oats	4,616	29
Hay	60	....	Barley	1,298	41
Field roots	25	699	Pease	93	59
Brome grass seed	....	1,590	Potatoes	250	....
Total	207	289	Total	7,543	26

CATTLE.

The cattle on the Brandon farm have kept in good health during the year; and the herd now consists of 21 head.

The following is a list of the names, breed, age and weight of the animals:—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Qu'Appelle Red Knight, bull	Shorthorn	5 years	2,210
Brandon Fashion, cow	"	5 "	1,180
Earl, bull calf	"	6 months	395
Duke, bull	Ayrshire	16 "	795
Dandy, cow	"	9 years	1,205
Primrose, heifer calf	"	6 months	500
Lida of Brandon, cow	Holstein	4 years	1,370
Lida's Princess of Brandon, cow	"	2 "	1,300
Manitoba Prince, bull	"	2 "	2,240
Siepkje, cow	"	10 "	1,210
Queen of Brandon, heifer calf	"	9 months	610
Siepkje of Brandon "	"	7 "	465
Richard Lyons, bull	Guernsey	22 "	1,065
Lady Jane Grey, cow	Grade	10 years	1,170
Pansy, cow	"	4 "	1,330
Violet, heifer	"	2 "	1,175
Jennie "	"	2 "	1,170
Fanny Fern, cow	"	3 "	1,330
Spotty, steer	"	14 months	620
Jack, steer calf	"	6 "	420
Jill, heifer calf	"	6 "	375

EXPERIMENTS IN FEEDING STEERS.

In 1895, a test was made on this farm of the feeding value of marsh hay, as compared with oat sheaves; this year marsh hay was fed in comparison with mixed straw.

For this purposes, eight Shorthorn grade steers three years old were purchased, in December, 1897, at 3 cents per pound live weight, and sold in April at 4 cents.

The steers were divided into two evenly matched groups of four each, and fed all they would eat clean of the following rations.

First Lot of Steers.

	Lbs.
Native marsh hay cut	20
Swedish turnips	30
Barley chopped	3 to 7

Second Lot of Steers.

	Lbs.
Mixed straw cut	20
Swedish turnips	30
Barley chopped	5 to 9

The first lot of steers were fed three pound of grain per day for the first four weeks, and the second lot five pounds per day, thus compensating for the difference in quality of fodder, this amount was in each case increased by two pounds each month, until the maximum of 7 and 9 pounds respectively was reached.

The actual amount and estimated value of the feed consumed per head during the feeding period of 112 days, was as follows.

First lot of Steers.

2,166 lbs. native hay, at $5 per ton	$ 5 41
44 bushels turnips, at 5c. per bush	2 20
622 lbs. chopped barley at ½ cent per lb	3 11
	$10 72

Second lot of Steers.

2,160 lbs. mixed straw.	
45 bushels turnips at 5c per bush	$ 2 25
860 lbs. chopped barley at ½ ct. per lb	4 30
	$ 6 55

Summary of Results.

—	First cost of Steers per head.	Value of feed consumed per head.	Average price sold for per head.	Profit per head.	Average daily gain per head.
	$ cts.	$ cts.	$ cts.	$ cts.	Lbs. oz.
First lot of steers fed with hay	36 10	10 72	54 36	7 54	1 6
Second lot of steers fed with straw	35 62	6 55	53 08	10 91	1 4

The margin between the fall and spring prices of cattle last season was much less than usual, and for that reason the profits of stall feeding was greatly lessened.

From the foregoing tables it would appear that hay is not essential to the successful fattening of steers, and our numerous wheat farmers can utilize to good advantage a portion of their straw for that purpose.

SWINE.

The herd of swine on the farm still continues in good health, and consists now of the following animals :—

Name.	Breed.	Age.
Sir Richard, boar	Berkshire	2 years.
Lady of Brandon, sow	"	6 months.
Crocus of " "	"	6 "
Boar (not named)	"	
Amber Belle, sow	Tamworth	3 years.
Dunrobin, boar	"	18 months.
Amy's Choice 2nd, sow	"	7 "
Brandon Belle "	"	2 "
Squire, boar	Chester White	18 "
Nelly, sow	"	9 "

POULTRY.

Only two breeds of poultry are now kept on the Brandon Experimental Farm—Plymouth Rocks and Black Minorcas.

By limiting the number of breeds to two, more room is left for experiments each year. Both breeds have been perfectly healthy, none having died during the year.

Pullets Compared with Old Hens as Layers.

It is generally thought that too many old hens are kept on the average farm, thus reducing the number of eggs, especially during the winter months.

With the object of testing this matter two pens each containing 11 birds were made up.

Hens.—7 Black Minorcas, 2½ years old.
4 White Plymouth Rocks, 2½ to 4 years old.
Pullets.—7 Black Minorcas, 6 months old.
4 White Plymouth Rocks, 6 months old.

How they were Fed.

Morning meal: equal parts of mixed crushed grain, and 1 oz. of cut bone per fowl; mixed and fed moistened.

Evening meal: ½ wheat screenings, ¼ oats, ¼ barley, all fed whole.

Results.

Number of eggs laid from 4th January to 4th March:

	Eggs.
Pullets	144
Hens	105
Pullets over hens	39

Bone as an Egg Producer.

It is very generally conceded that the feeding of green cut bone materially increases the number of eggs laid, especially during the winter months.

To test this two pens were made up, each consisting of 3 Plymouth Rock pullets and 3 Black Minorcas, all six months old.

How they were Fed.

Pen 1.—Morning meal: equal parts of bran and mixed crushed grain, and one ounce of green cut bone per fowl; the above was mixed together and fed moistened. The evening meal consisted of ½ wheat screenings, ¼ oats, and ¼ barley, all fed whole.

Pen 2.—Received the same food, except that the bone was omitted.

Result.

Number of eggs laid from 4th January to 4th March:

	Eggs.
Pen 1.—Fed green crushed bone	83
Pen 2.—Without bone in their food	52
Gain from using bone	31

Fattening Poultry.

The experiment given on page 333 of last year's Annual Report was repeated in some of its details this year, an effort being made to ascertain the cost per pound of gain in one month when chickens are fattened in pens.

	Lb.	Oz.
Oct. 25th—Weight of 4 Plymouth Rock chickens penned...	16	14
Nov. 25th— " " " ...	22	04
Gain	5	06

Feed consumed.—7½ lbs. wheat, 3¾ lbs. oats, 3¾ lbs. barley.

	Cents.
Value of grain at 1c. per lb.....	15
Cost of feed per pound of gain in one month.....	3

The grain was crushed and moistened for the morning meal, and fed whole for the evening meal.

BEES.

The four hives of Italian bees remaining on hand last fall, were placed in the cellar of one of the farm dwellings on the 4th of October, the usual time in this latitude. But the fall being an open one the bees were quite restless until about the 4th of November, when the temperature in the cellar fell to about 55° F., and after that they were quiet. The evil effects of the high temperature in October was quite noticeable, particularly in the stronger colonies where they were somewhat crowded, and a much larger number than usual died during the winter.

They were placed on the summer stands on the 14th of April, two weeks earlier than in 1897. Native willow again furnished the first honey and pollen.

The spring and early summer were favourable for honey gathering, but the late summer and fall months were both cloudy and wet, and very little honey was gathered in these months.

An average of 53 pounds of extracted honey was taken from each of the four hives, which was sold for 10 cents per pound wholesale.

Three new swarms were hived, one of which was sold leaving six on hand at this date.

The bees were kept on the summer stands until November 11th this year, by which time the cellar temperature had fallen to 47. So far they have remained perfectly quiet.

LARGE AND SMALL FRUITS.

Wild Crabs of Siberia.

The orchard devoted to these trees has received additions from time to time, since 1890.

Pyrus baccata aurantiaca again gave a crop of small fruit. Other and more recently planted varieties, viz. :—*P. B. cerasiformis*, *P. B. macrocarpa* and *P. B. edulis* for the first time flowered this season, but the blossoms proved abortive. The season being propitious, the trees are in a fine condition for the production of fruit next year.

Crab Apples.

The crab apples now undergoing test are *Quaker Beauty*, *Melonen*, *Gideon*, *Jumbo*, *Martha*, *Snyder*, *Yellow Siberian* and *Transcendant*. The last mentioned has been grown here nine years but has been more or less injured by frost each winter.

STANDARD APPLES.

The two *Tonka* and two *Wealthy* trees mentioned on page 336 of last year's report, came through last winter successfully, and this season they have made a strong and healthy growth.

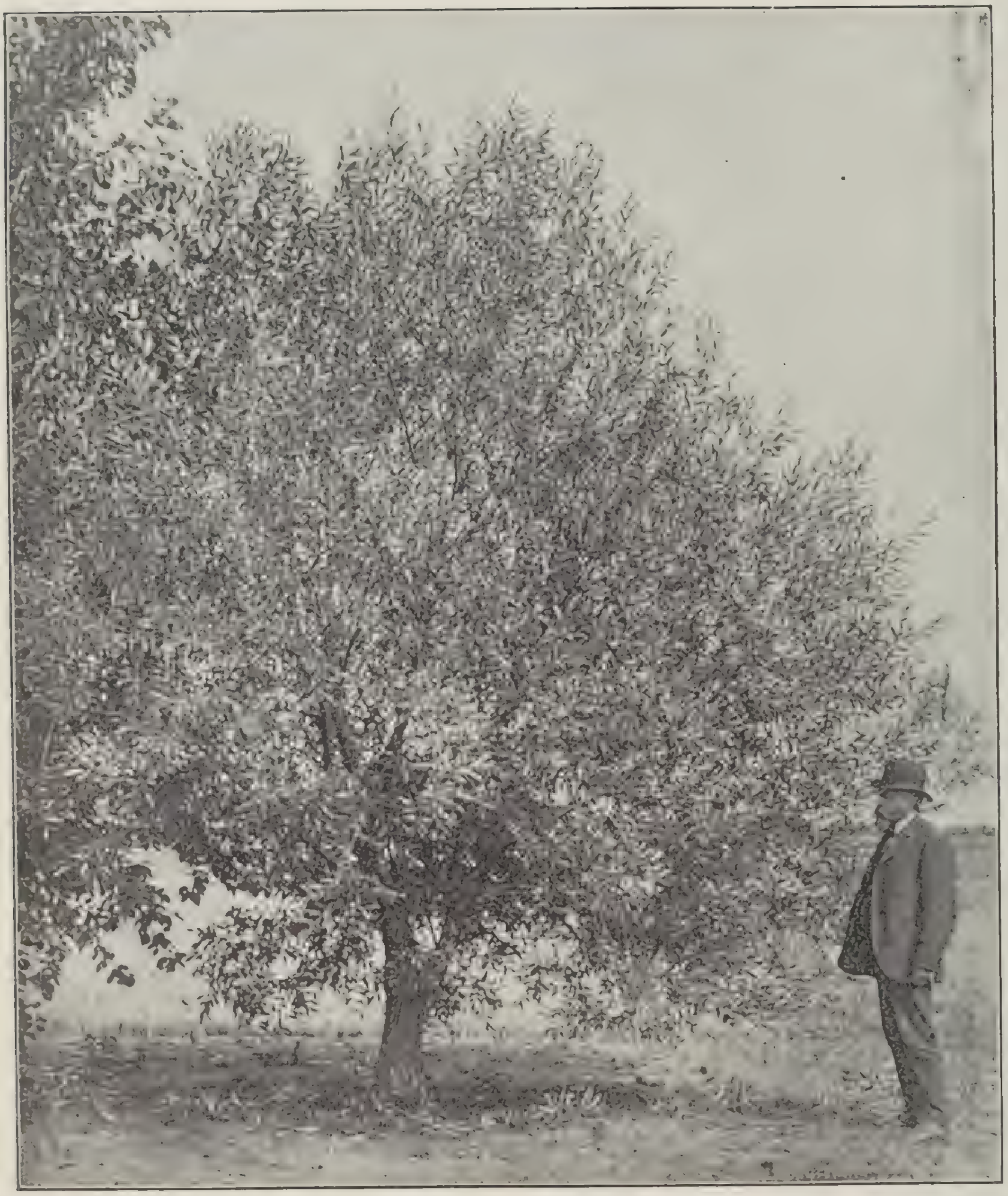
CROSS-BRED APPLES.

The want of success in finding apples sufficiently hardy to endure the climate of the higher altitudes of this province has led to the breeding of varieties by cross fertilization at the Central Experimental Farm at Ottawa. The first consignment of these cross-bred varieties was received on 4th April, 1898, in good condition, and planted in an orchard prepared for that purpose. Some of these were one year old seedlings and some newly grafted stocks.

It was thought advisable to plant them all in permanent position, so that no check would result from further transplanting.

The situation was rather open, and very dry weather setting in coupled with high winds caused the soil to drift, this cut off some of the young and tender shoots as they appeared. From the following record it will be seen that this experiment has thus far been attended with fair success.

Number received.	Record Number.	Female Parent.	Male Parent.	Seedlings or Grafted Stocks	Number Alive.	Number Dead.	Remarks.
9	....	Pyrus baccata...	Talman's Sweet.....	Seedlings................	9	0	Healthy growth.
9	....	" ..	Wealthy..	"	8	1	"
4	....	" ..	Red Astrachan	"	3	1	"
12	....	" ..	Tetofsky	"	12	0	"
6	....	" ..	Pewaukee	"	5	1	One not healthy.
2	....	" ..	Excelsior	"	2	0	Strong growth.
1	...	" ..	Duchess............	"	0	1	Did not start.
7	...	" ...	Swayzie Pom. Grise.	"	6	1	Fair growth.
2	....	" ..	Yellow Transparent.	"	1	1	Healthy growth.
3	....	" ..	Martha Crab	"	3	0	Healthy ripe growth.
1	....	" ..	McMahan White ...	"	1	0	Very healthy.
3	...	Pyrus prunifolia	Pewaukee	"	3	0	Fairly healthy.
2	....	Pyrus baccata...	Wealthy..........	Grafted on Pyrus baccata..	0	2	Did not start.
3	118	" ..	"	" " ..	0	3	Killed by sand storm.
5	117	" ..	"	" " ..	2	3	Healthy growth.
2	165	" ..	Red Anis...........	" " ..	2	0	Very healthy.
1	30	" ..	Hyslop Crab........	" " ..	1	0	Fairly healthy.
2	46	" ..	Tetofsky	" " ..	0	2	Killed by sand storm.
4	125	" ..	Wealthy............	" " ..	0	4	Did not start.
3	142	" ..	Duchess	" Pyrus prunifolia	0	3	"
1	45	" ..	Tetofsky	" Pyrus baccata..	0	1	"
3	116	" ..	"	" Pyrus prunifolia	2	1	Healthy growth.
3	16	" ..	Orange Crab........	" " ..	1	2	Fairly healthy.
3	164	" ..	Red Anis	" Pyrus baccata..	2	1	Healthy growth.
3	112	" ..	Hyslop Crab.......	" " ..	2	1	Very healthy.
3	1	" ..	Orange Crab........	" Pyrus prunifolia	0	3	Killed by sand storm.
5	127	" ..	Wealthy...........	" Pyrus baccata..	1	4	One healthy.
2	53	" ..	Tetofsky	" " ..	0	2	Did not start.
2	107	" ..	Hyslop.............	" Pyrus prunifolia	0	2	"
4	161	" ..	Red Anis...........	" " ..	2	2	Healthy growth.
3	19	" ..	Transcendant.......	" " ..	2	1	One fairly healthy.
4	29	" ..	"	" " ..	2	2	Strong growth.
4	162	" ..	Red Anis...... ...	" Pyrus baccata..	0	4	Killed by sand storm.
1	64	" ..	Tetofsky...........	" " ..	0	1	" "
3	122	" ..	Wealthy............	" " ..	2	1	Very strong growth.
2	141	" ..	Duchess............	" " ..	1	1	Healthy growth.
2	79	" ..	Tetofsky	" " ..	0	2	Killed by sand storm.
2	132	" ..	Wealthy............	" " ..	1	1	Fairly healthy.



White Willow (*Salix alba*) height 17 feet, circumference near base 26 inches, growing on Experimental Farm at Brandon, Manitoba, nine years planted. [305]

PEARS.

One Longworth pear was planted in 1897. It became well established, but like all other trees of this fruit, it succumbed to the first winter's frost.

Pyrus betulæfolia. This was received from the Central Experimental farm last spring; it is said to produce a very small fruit, but if hardy it may be useful for future selection and crossing.

PLUMS.

Last winter was very disastrous to the varieties of improved American plums received from Charles Luedloff, of Carver, Minnesota, in the spring of 1896; these have had a very fair test, specimens of all becoming established the first summer. They were more or less injured by frost the first winter, but the trees being then very small and the snow fall of that winter unusually heavy, they were completely covered and many survived the first year. In the spring of 1897 it was found that, of 72 trees including 36 varieties planted in the spring of 1897, 4 varieties were dead, 18 killed to the ground; 7 were slighty killed back and 7 were apparently hardy; of these 3 had some bloom but no fruit. On the count being taken last spring, 1898, only 9 trees of 7 varieties were found living, leaving 63 trees of 29 varieties that have succumbed to the severe frost and slight snow covering of last winter.

The seven surviving varieties are:—

Variety.	Number planted.	Number alive.	Remarks.
Richland	2	2	Weak growth; killed back.
City	2	2	Fair growth; killed back.
Dunlop Nut	2	1	Weak growth; slightly killed back.
Speer	2	1	Strong growth; not killed back.
Van Deman	2	1	Fair growth; slightly killed back.
Gaylord	2	1	Weak growth; badly winter killed.
New Ulm	2	1	" "

The orchard of plum seedlings received from the Central Farm at Ottawa in 1893, have made a good growth, they have now an average height of six feet, and seem very healthy and vigorous.

This orchard contains 127 seedlings of Weaver, 12 seedlings of Cheney and 34 American seedlings. Many of these fruited for the first time this year. Those that fruited are:—11 trees of Weaver, 1 of Cheney, 2 of DeSoto and 1 of American seedling. This fruit was fair in size, but, although the frost came later than the average season, none of it matured, and when picked on 1st October the specimens were found to be pithy, and devoid of flavour; evidently having been frozen by the severe fall frosts before being fully ripe.

Two of the consignment of unnamed plums received from Mr. Thos. Frankland, of Stonewall, Manitoba, also fruited this year. One of these had fruit of a fine egg shape, but like the others they did not mature before they were injured by frost.

NATIVE PLUMS.

The trees of the native seedling plums that were old enough have again given a large crop of very fair fruit, averaging 10 quarts from each tree. These were ripe on 1st September, and were not injured in the least by the slight frost previous to that date.

The work of propagation is still going on with this plum, and some good results have already been attained.

One Aiken and three Hoskin plums were received from the Central Farm in the spring of 1897. The Aiken succumbed the first winter; one Hoskin survived but was killed to the ground and is by no means promising.

The additions to the list of plums this season are—

Seedlings of Wyant.
do Forest Garden.
do Rollingston.
do Hawkeye.

Cherries.

In the spring of 1895 there were sent from Ottawa 5 each of 6 varieties of cherry seedlings; these have survived two winters, but none of them have as yet fruited.

They are herewith listed with notes:—

Name of Variety.	Number received.	Number alive.		Remarks.
	1895.	1896.	1897.	
Seedlings of—				
Bessarabian	5	4	4	Alive to tips; small growth.
Montmorency	5	5	5	" "
Red Morello	5	5	4	Killed to near ground; large growth.
Wragg	5	4	3	" fair growth.
Olivet	5	5	5	Alive to tips; small growth.
Carnation	5	5	5	Slightly killed back; small growth.

Rocky Mountain Cherry.

Fifteen bushes of this cherry were received and planted in 1895. They are all alive at this date, and have borne a small amount of fruit. They are evidently a variety of the sand cherry *Prunus pumila.*

Prunus Mackii and *Prunus Padus* were two cherries received from Prof. Budd in 1894. Specimens of each of these fruited this season; the fruit is small and astringent, and is of no value as an edible fruit. The trees are useful, however, for ornamental purposes.

Wild Cherry from Nebraska.

Three of these were received from Ottawa in the spring of 1896. They are quite hardy and have made a strong growth, but have not yet fruited.

Compass Cherry.—Two trees were received this spring and have become well established. This is said to be a cross between the Sand Cherry and the American Plum, having some characteristics of each, and is spoken of highly. It is hoped it will prove hardy here.

Sand Cherry.—In the spring of 1894, 200 seedlings of the eastern form of this cherry were received from Ottawa. These have not been hardy with us as yet, and have been killed to the snow line each winter, but having a recumbent habit many of the branches lay below the snow; on these branches fruit was set on nearly all the trees for the first time this season.

They were inspected individually, and out of the 200 trees only two yielded fruit that was up to the standard of fruit obtained from the selected forms of our native Sand Cherry, and many were too late to be of value here.

Manitoba Sand Cherry.

On the Director's annual visit of inspection last August, another one, out of many seedlings of this native cherry was pointed out as worthy of a name and of propagation. It was named and described by him as follows :—

Champion.—Large, very dark red, nearly black when ripe ; flesh sweet and nearly free from astringency, $1\frac{7}{8}$ inches in circumference ; quality good, quite ripe 25th August.

The *Minnie*, *Brandon*, *Othello*, *Standard*, *Progress* and *Challenge*, named varieties of this cherry, are being propagated by layering, and are being gradually disseminated throughout the province.

Grapes.

Three varieties of grapes were planted in the spring of 1895, and have survived three winters. Two of these were received from Ottawa, viz.: *Gibb* and *Bacchus* ; they have made only a small growth, and have as yet given no signs of fruit. The third variety is the native wild grape, which has made a very strong growth, it flowered this season, but the flowers proved to be imperfect, all being staminate, and hence this variety is of no value.

Wild grape cuttings and roots have been procured from many different sources, in Manitoba, with the hope of finding some with perfect flowers.

Currants.

The currant crop this year was an average one, all the old varieties fruiting fairly well. At this time there are 40 kinds undergoing test, and valuable facts in reference to their hardiness and quality are being compiled.

Fertile d'Angers,—a red currant, which is well worthy of special notice. The berries are as large as Fay's Prolific (one of the largest of red currants) but the bunches are larger and better filled than that variety.

If this variety continues to do as it has done the past season it will be a great acquisition to this province.

The *White Dutch* was the only new white currant tested. This is not by any means superior to the White Grape, but being much later than that variety it will be useful for a succession of fruit.

The *Climax* spoken of in previous reports still holds a prominent place among the black varieties.

The *Eclipse*, a black currant seedling from the Central Farm, has fruited this year for the first time, and gives great promise of future usefulness.

Missouri Tree Currant—black. More fruit was picked from this than from any other variety during the past season, and in size, colour and habit it is unique among currants ; it has a peculiar flavour, and cannot be recommended for extensive planting, but a few bushes would be an acquisition to every garden. The bushes are hardy and seem to be well adapted to this climate.

The following varieties fruited here for the first time this season.

Variety.	Flavour.	Colour.	Size.	Earliness.	Productiveness.	Remarks.
Fertile d'Angers	Very good	Red	Very large	Late	Good	Vigorous growth.
North Star	Fair	"	Medium	Early	Poor	Very vigorous.
White Dutch	Good	White	Large	Late	Fair	Slightly tender.
Sterling	Fair	Black	"	Medium	Good	Very vigorous.
Perry	Poor	"	Small	Early	Poor	Generally poor.
Madoc	"	"	Fair	Medium	"	Healthy.
Eclipse	Very good	"	Large	Early	Good	Vigorous.
Lewis	Poor	"	Medium	Very early	Fair	"
Stewart	Good	"	Fair	"	Good	Very healthy.
Star	"	"	Large	"	"	"

Gooseberries.

The native sand hill gooseberies fruited well this year, and have been increased largely by cuttings. Seed of the very finest fruit was selected and sown, and it is hoped by this means to improve this desirable native fruit.

Six each of 10 new varieties of gooseberries were received from the Central Experimental Farm and planted in the spring of 1897; they made a fine healthy growth that season.

No winter protection was given them and this spring most of the bushes were found to be more or less injured and many were killed outright.

The survivors are being treated this year in the same way as the raspberries :—namely by laying them down and covering them with earth, and it is hoped by this means to bring them safely through the coming winter.

List of Gooseberries tested one winter.

Name of Variety.	No. planted.	No. alive.	Remarks.
Industry	6	2	Good summer growth.
Keepsake	6	0	Killed by winter.
Chautauqua	6	3	Good summer growth.
Red Jacket	6	1	Weak growth.
Smith's Improved	6	6	Vigorous growth.
Houghton	6	1	Healthy summer growth.
Downing	6	2	Weak growth.
Golden Prolific	6	0	Killed by winter.
Columbus	6	2	Fair growth.
Whitesmith	6	4	Very vigorous growth.

Raspberries.

The raspberry canes, although laid down and covered with earth, suffered more from the frost of last winter than any one other season since they were planted.

There is one variety, however, known as Reeder, which was exposed to exactly the same conditions as the other sorts, but has shown greater hardiness and passed through the winter almost uninjured. Out of 21 varieties tested this yielded the most fruit.

The Sarah, Turner and Philadelphia were, next to the Reeder, the least injured by the winter.

Snyder Blackberry fruited this year for the first time. It bore large bunches of fine fruit which ripened very late. This blackberry has wintered here three seasons, but requires some protection.

No new raspberries were planted this season, but many imcomplete rows were filled. This work can be done any time through the early part of the summer after the suckers have started to grow by transplanting the young green shoots.

A dull rainy time is generally chosen for this work. Holes are dug where the plants are required; good thrifty suckers are selected and dug with a sharp clean spade, care being taken that a lump of earth adheres to the roots in each case, and this, without being disturbed, is placed carefully in the holes prepared and firmly pressed.

Prune back slightly, and if the sun becomes very hot, shade for a few days with a shingle.

By this method, the raspberry plantation can be rapidly increased, as most varieties produce suckers freely, and the work can be done at a less busy time than during the spring.

FOREST TREES.

The trees in the shelter belts and plantations continue to thrive, many of the varieties having made very fine specimens. A list of those believed to be suitable for general planting is here continued, which it is hoped will be found useful to intending planters.

Populus Petrowskiana—Russian Poplar.—This is one of the fastest growing varieties of the poplars imported from Northern Europe. It has luxuriant foliage, which hangs late on the tree. A nine year old tree was recently measured here, and found to be twenty feet high, with twelve feet spread of branches. The trunk one foot from the ground was five inches in diameter. This is propagated by cuttings.

Betula alba laciniata—The Cut-leaved Birch.—This is a variety of the White Birch of Europe; and is fairly hardy here. Its symmetrical habit, coupled with its graceful pendulous branches and finely cut leaves, makes it a desirable acquisition. A tree five years planted is ten feet high. This can be propagated only by grafting or budding. As it is somewhat difficult to transplant, much care should be exercised in this operation.

Betula pumila—Dwarf Birch.—This is a dwarf variety indigenous to this conntry. Its maximum height is about ten feet; its form is attractive and its dwarf habit makes it useful for hedge purposes. The seed is ripe in August, but only a small percentage of it is usually found to germinate. Seedlings may be procured from the woods, where it grows in some localities in great profusion.

Alnus viridis—American Alder.—This is also a native tree, with a dwarf habit. The present height of a tree on this farm, eight years old, is nine feet, with a spread of branches of three and a half feet.

Picea pungens—Rocky Mountain Spruce.—Specimens of this tree have now stood six successive winters. To secure the best results this tree should be planted in the shelter of other trees and shrubs, as it is often hurt by the hot dry winds that prevail on the open plains. It is a native of the Rocky Mountains in Colorado.

Larix Europæa—English Larch.—One specimen, the only survivor of a large consignment received in 1890, is doing wonderfully well; it is ten feet high and seems quite hardy. Our native larch (*Larix Americana*), however, is much more successfully grown.

Thuya occidentalis Elwangeriana.—This is a beautiful variety of the western Arbor Vitæ, and has a more finely cut foliage and a very symmetrical form. Specimens have proven hardy here when grown in protected situations.

Cost of Planting and Maintaining Forest Trees.

In the spring of 1895, a plantation of one acre in extent was planted near the main road with two-year-old seedlings of the native Ash-leaved Maple and White Elm. The object in planting this plot was to ascertain the cost of planting and maintaining an acre of trees until they were large enough to shade the ground and prevent the further growth of weeds. After four years this plot has reached that stage, and in future will be kept clean with a few hours' work around the edges. The average height of the trees is eight feet.

Particulars of the cost of planting and taking care of these trees for 4 years are herewith submitted.

Approximate cost of growing and digging trees...........	$ 5 00
Cost of planting, 20 hrs. work..........................	3 00
Filling vacancies, 5 hrs. work..........................	0 75
1st year, cost of cultivation, hoeing, etc, 20 hrs. work	3 00
2nd " " " 15 "	2 25
3rd " " " 10 "	1 50
4th " " " 5 "	0 75
	$16 25

Another experiment of this sort was begun last season by the planting of an acre plot with elm, maple and ash with alternate rows of Sand Cherry. The object of this experiment is to ascertain how quickly the Sand Cherry will shade the ground and save the labour of further cultivation.

This plot has become well established, and the trees are growing rapidly.

Avenues.

Three kinds of trees have been used for avenue planting, and up to the present time about three miles of roads have been improved by planting there double rows of trees.

The native Ash-leaved Maple (*Negundo Aceroides*) has been chiefly used. This well known and deservedly popular tree seems especially adapted for this purpose here, it thrives luxuriantly and is kept in order with a small amount of work.

Avenues have been successfully planted here by selecting trees about four or five years old of good shape ; nursery grown specimens on account of their superior root development are preferred. When the row is planted the trees are pruned to a uniform height and, as far as is practicable, the same uniformity is observed in the height of their lowest branches, as this adds much to the beauty of the avenue. Twenty feet apart is about the right distance to plant this tree. Cultivation is carried on as follows:

When the first crop of weeds have come nicely through the ground, which is about the 1st of June, a space of at least four feet on each side of the row is ploughed with a one horse plough, the ploughing near the tree being very shallow to avoid injuring the roots. This is followed by a good harrowing with one large section of a harrow. Later in the season the ground should be kept clean with a one horse cultivator. Pruning is done each year in July, as at this season wounds in the tree heal rapidly. Any pendulous branches are shortened, and any dead wood found is cut out.

When examining the avenues here this season twenty of the trees were found to be unhealthy. This was attributed to two causes. Six of them were found to be in low undrained locations, and on digging three of these their fibrous roots were found to have rotted, which was probably the cause of death. The soil in these low places was a stiff clay locally known as gumbo. In replanting trees in such places, holes should be made much larger than required for the roots and soil added from the higher land on the farm ; if slightly gravelly, so much the better. This method is also followed when planting trees in alkaline spots.

The remaining trees were found to be badly affected by sun-scald and in some cases the wood had split the whole length of the stem and much of the bark was dead. This may be treated by carefully paring off the dead bark until the hard wood is reached, when the edges of the wound will callous and the wound will often heal.

Native Spruce *Picea alba* is another tree which has been used here to advantage for avenue planting and has made fine growth, in some cases outstripping the maples in height.

Its evergreen foliage makes it a very desirable tree for this purpose.

Another tree which has been used here for avenues is the Russian poplar (*Populus Bereolensis*). This is a fast growing species and is much admired for its symmetrical form. It also has the advantage of retaining its leaves until quite late in the season.

Notes on the Arboretum.

In the spring of 1893, on a rough looking hillside surrounding the then newly built Superintendent's house, the nucleus of an arboretum was started ; a terraced lawn was graded and laid down to sod, and about one hundred trees, of forty varieties planted ; since that time each year new varieties have been added, until at present 1,023 trees of 226 varieties and species are growing. This has changed the aspect of the landscape and given beauty to the surroundings.

In the summer this plot claims much attention from the visiting public, and from the many inquires made and the growing interest manifested in tree growing throughout the province, it is evident that this department of the farm is doing good work.

A catalogue of this plantation has been made, each tree has been numbered and a record made of time of planting, hardiness, etc.

A very substantial enlargement was made this year by the addition of many varieties received from the Central Farm two years ago and placed in a nursery then. They have thus been tested here for two winters; they are not all entirely hardy, but all stand the winter sufficiently well to make good specimens.

Additions to Arboretum.

Name of Variety.	Remarks on hardiness, growth, &c.
Alnus incana	Hardy, fair growth.
" viridis	" strong "
Acer monspessulanum	Half hardy, weak growth.
Alnus imperialis laciniata	Hardy, fair growth.
Amorpha fruticosa	" large growth, flowered.
Ampelopsis variegata	" fair growth.
Berberis ilicifolia	Half hardy, small growth.
" vulgaris purpurea	Hardy, small growth, flowered.
" Thunbergii	" "
Betula pendula Youngii	" fair "
Cornus sanguinea	Half hardy, strong growth.
" sericea	" "
Cytisus purpureus	Hardy where protected, flowered.
" trifolius	" " "
" hirsutus	" " "
Clematis ligusticifolia	" very strong growth, flowered.
" vitalba	Roots hardy.
" recta	Herbaceous, roots hardy.
Deutzia Wellsii	Tender, weak growth.
Diervilla lutea	Hardy, fair growth, flowered.
Hydrangea paniculata grandiflora	Half hardy, flowered.
Juniperus Sabina	Hardy, strong dwarf growth.
Lonicera Alberti	" strong growth, flowered.
Populus fastigiata	Half hardy, very strong growth.
" Bolleana	" strong growth.
Philadelphus deutziflorus	" weak "
" inodorus	" " "
" grandiflorus	" " "
" coronarius	" fair "
Ptelea trifoliata aurea	Hardy, fair growth.
Picea pungens	" small healthy growth.
Pinus ponderosa	" where protected from winds.
Abies nigra	" strong growth.
Rhamnus catharticus	" "
Ribes Gordonianum	" fair growth.
Syringa purpurea	" strong growth, flowered.
" villosa	" " "
" Chas. Xth	" " "
Sambucus pulverulenta alba	Roots hardy, weak growth.
" variegata argentea	" strong "
" Canadensis	Kills back slightly, strong growth.
" nigra	Roots hardy, strong growth.
" laciniata	" "
" aurea nova	" "
" heterophyllus	" "
Sorbus domestica	Hardy, fair growth.
Spiræa callosa rosea	" " flowered.
" " alba	" " "
" billardi alba	" " "
" " rosea	" " "
" ariæfolia	" strong growth.
" ulmifolia	" "
" multiflora	Half hardy, strong growth, flowered.
" Douglasii	Hardy " "
" Van Houttei	Half hardy, weak growth.
Thuya occidentalis Hoveyi	Hardy, fair growth.
" Wareana (Sibirica)	" strong "
" occidentalis lutea	" weak "
" " Elwangeriana	" strong "
Viburnum opulus sterilis	" strong growth, flowered.

Hardy Ornamental Shrubs.

The following are some of the more promising of the ornamental shrubs which have been tested here:

Amorpha fruticosa—Lead tree.—An indigenous species found growing in this vicinity. Its pretty racemes of flowers make it quite ornamental; the yellow anthers against the back ground of its violet petals, gives the whole a pleasing effect. This comes into flower about 20th June, and is followed by small pods, enclosing seeds from which it is readily increased.

Lonicera tatarica elegans—Elegant Bnsh Honey-suckle.—This is less vigourous in its growth than the common Bush Honey-suckle, but it blooms more freely and is thickly covered with light rose-coloured blossoms during the first week in June; these are followed by bright red berries. It is quite hardy and desirable, and may be propagated by layers or cuttings.

Lonicera gracilis—Graceful Honey-suckle.—In this species the flowers are almost white, followed by yellow fruit. It blooms early in June, and may be propagated from cuttings or by layers.

Sambucus Canadensis—Canadian Elder.—Of the many varieties of elder tested here this is the most vigorous and hardy. A three-year old bush is now four feet high with three feet of spread of branches. This is propagated by root division or from cuttings.

Spirœa Douglasii—Douglass Spirœa.—Height two to four feet. In bloom from 15th July to late in the autumn. This makes a pretty ornamental hedge, suitable for a flower garden, and is very pretty when covered by its dense clusters of pink flowers. This may be propagated by division of the root.

Viburnum Lantana—Way-faring Tree.—This is a handsome ornamental shrub with strongly veined lantana-like leaves. Its flowers are white and are succeeded about the third week in July by pretty clusters of purple fruit, which eventually become black.

Viburnum Lentago—Sheep-berry.—This is a native shrub of much merit. Its large shiny leaves and compact habit of growth combined with the abundance of its flowers and fruit gives it a pleasing appearance. This can be obtained by transplanting naturally grown seedlings or can be raised from seed. This, however, rarely germinates the first season.

Clematis ligusticifolia—This species of clematis is found growing wild in some parts of the North-west Territories and is common also in British Columbia. It is very hardy, grows rapidly and forms a useful climber for a verandah. It is a free bloomer and can be grown from cuttings, layers or seed.

Ligustrum Amurense—Amur Privet.—This is a pretty, almost evergreen shrub, which has so far proven hardy here, and will be found useful for borders or low hedges.

Cytisus hirsutus—Hairy Cytisus.—This littly shrub is well worthy of a place in every collection; it flowers freely through July, and will grow readily from seeds, which are freely produced in small hairy pods. It is not entirely hardy and succeeds best when protected in winter by a covering of earth.

Syringa villosa—Rough-leaved Lilac.—This species of lilac is from Northern Asia and like Syringa Josikea will be found very useful in this province; flowering late it thereby escapes the spring frosts, which so often kill the flower buds of the common lilac. It comes into bloom the second week in July; the flowers are light purple, and the foliage is very much admired.

Hedges.

The sample hedges grown here for comparative test purposes are steadily increasing in number. This feature in our work claims much attention from the general public, especially as the utility of hedges as wind-breaks and snow collectors becomes more apparent. Of the hedges planted in the spring of 1897, all survived the winter, with

Seedling Lilac, eight years planted, growing on Experimental Farm at Brandon, Manitoba.

the exception of the Rosemary-leaved Willow (*Salix rosmarinifolia*), this was killed root and branch. This left 34 hedges living last spring; and to these have been added 11 other species and varieties, making a total of 44 different kinds of hedges now living.

Additions to sample hedges in 1898:—

Lonicera Alberti,	Albert Honey-suckle,
Syringa Josikea,	Hungarian Lilac,
Spiræa Douglasii,	Douglas' Spiræa,
Ligustrum Amurense,	Amur Privet,
Celtis occidentalis,	Nettle Tree,
Rosa rugosa,	Japan Rose,
Shepherdia argentea,	Buffalo Berry,
Artemisia Abrotanum,	English Old Man,
Caragana grandiflora,	Large-flowered Pea Tree,
Lonicera tatarica splendens,	Splendid Honey-suckle.

Distribution of Tree Cuttings.

In accordance with instructions received from the Director last spring, twenty-five thousand cuttings of Cottonwood, Russian Poplar and Willows were prepared and mailed to applicants. Although instructions for this work were received rather late in the season for the best results, we were able to supply all applicants with a package containing 100 cuttings, which was generally made up as follows: 25 Cottonwood, 25 Russian Poplar, 25 Sharp-leaved Willow and 25 Voronesh Willow.

From reports received we learn that very few of the Willows failed, a number of the Russian Poplars struck, but poor success was had with the Cottonwoods, the spring evidently being too dry to permit of the rooting of the wood of this moisture-loving tree.

On this farm Cottonwood cuttings made and planted deeply in fallowed land as soon as the ground is thawed out in the spring, have generally rooted well, but when cut late in the spring, or planted on spring ploughed stubble, they have nearly always failed.

The total number of applicants supplied with tree seedlings and cuttings during the year was 1,237, which is 331 more than last year.

THE VEGETABLE GARDEN.

The season of 1898 was, in many respects a peculiar one for vegetables. Spring was ushered in by a long continued spell of dry weather, and, beyond a slight shower or two, no rain whatever fell until the 25th of May. To aggravate the conditions caused by the drought, high winds were experienced, and the combination of the two evils, caused us at one time to contemplate the entire re-sowing of the vegetable garden. The merits of fairly deep and thick sowing was admirably illustrated in this connection; for, although some of the seed was certainly blown out, the rows were all well filled on the approach of more favourable weather. On the 5th and 6th of June, we received a good soaking, and the balance of the season was all that could be desired, as regards rainfall. The cool weather in the fall interfered considerably with the maturing of some of the late vegetables, and for the first time for some years past, we failed to harvest a crop of ripe tomatoes. This may be accounted for by the fact, that, about the time the first blossoms were setting fruit, we had, a very heavy rain, which appeared to greatly interfere with fertilization, and, as we generally depend on the first flowers for ripe fruit, the failure may be fairly attributed to the above cause. Onions were also thrown back by the very dry condition of the soil in early spring, and did not germinate until quite late, causing the late maturing of this useful crop. With the above exceptions, the yield and quality of vegetables was all that could be desired. All root crops, with the exception of carrots, gave unusually heavy returns, and cucumbers, squashes and pumkins were far above the average. Taken on the whole, the season may safely be termed a favourable one for vegetables. In the experiments with vegetables here the effort has been made to thoroughly test two or three different kinds, procuring as many varieties of each as possible. Those to which special attention was given during the past season, were

beets, cabbage, and cucumbers, and following will be found the results of these tests, together with other portions of the work done in this department.

Cabbage.

The method adopted this season for raising cabbage plants, was one which we have found by experiment to give the best results with a minimum of labour. The seed was sown thinly in a spent hotbed on 19th April, in rows six inches apart, and as soon as the plants were large enough to handle, they were thinned, this operation taking place on 30th April. It is of the utmost importance that thinning should be performed before the seedlings are too tall, a day or two's delay at this time making the difference between dwarf, strong plants and thin straggling ones. From this time air was given whenever the weather permitted, and on 30th May a frame of sturdy and healthy plants were transferred to the open, in rows three feet apart, and two and one-half feet apart in the row. By adopting this p'an, all the labour of transplanting from seed boxes was rendered unnecessary, and the result was fully equal to that previously attained by the mode of twice transplanting. Forty-one varieties were sown, four of which did not germinate, viz.: Quintal Drumhead, Stonemason, Extra Early Etampes and Early Oxheart. The wet fall season proved exceptionally favourable for this crop, and the average was above the ordinary, with the exception of the red varieties, which, for some reason, have not proven satisfactory for some years past. Following will be found the result of this test, together with a list of the most suitable varieties :—

Name of Variety.	Average Weight.	Firmness.	Percentage Headed out.	Early or Late.	Shape.
Savoy Drumhead	7 pounds.	Fairly firm	70 per cent.	Late	Flat.
Hollander	14½ "	Very "	100 "	"	Rounded.
Autumn Giant	14½ "	Firm	73 "	"	"
Early Brunswick	11½ "	Very firm	100 "	2nd early	Flat.
Large Late Drumhead	12 "	Firm	85 "	Late	Rounded.
Early Large York	8½ "	Fair	94 "	Early	Pointed.
Tottler's Brunswick	10 "	Very firm	90 "	2nd early	Flat.
Early Favorite	4½ "	Soft	85 "	Early	Rounded.
Quintal Drumhead (did not germinate)					
Early Dwarf York	7 "	Fairly firm	75 "	"	"
Vandergaw	13 "	Very "	100 "	Late	Flat.
Stonemason (did not germinate)					
Victoria Savoy	8 "	Fairly firm	98 "	"	Rounded.
Early Sugar Loaf	8 "	"	100 "	Early	Conical.
Early Winningstadt	7½ "	Very firm	100 "	2nd early	Pointed.
Red Drumhead	8 "	"	58 "	Late	Rounded.
Extra Early Etampes (did not germinate)					
Chester King	7½ "	Fairly firm	100 "	Very late	Flat.
Succession	13 "	Very firm	100 "	2nd early	Rounded.
Pearce's 2nd Crop	14½ "	"	100 "	"	Flat.
American Savoy	8 "	"	97 "	Late	"
Premium Flat Dutch	23 "	"	93 "	"	"
Early Oxheart (did not germinate)					
The Lupton	19½ "	"	100 "	"	"
All Season	14½ "	"	100 "	2nd early	Rounded.
Early Summer	12½ "	"	100 "	Early	Flat.
Early Jersey Wakefield	9 "	Firm	92 "	"	Conical.
Surehead	17 "	"	97 "	Late	Rounded.
New Extra Early Express	6 "	"	96 "	Early	"
Filderkraut	8 "	Very firm	100 "	2nd early	Pointed.
Deep Head	13½ "	"	78 "	Late	Rounded.
Danish Ball Head	16 "	"	100 "	"	"
Globe Savoy	8½ "	Soft	83 "	"	"
St. Denis	10 "	Very firm	100 "	2nd early	Flat.
Chester Savoy	12½ "	Firm	97 "	Late	"
Luxembourg	8 "	"	96 "	Very late	Rounded.
Matchless Flat Dutch	15 "	"	83 "	Late	Flat.
Burpee's All Head	16½ "	Very firm	100 "	2nd early	"
Marble Head Mammoth	20 "	"	100 "	Late	"
Dark Red Early Dutch	6 "	Firm	64 "	"	Rounded.
Dwarf Ulm Savoy	3 "	Very soft	46 "	2nd early	"

Desirable Early Sorts.—1. Early Jersey Wakefield; 2. Early Sugar Loaf.

Second Early or Summer.—1. Early Brunswick; 2. Filderkraut.

Late or Winter.—1. The Lupton; 2. Marblehead Mammoth.

The following varieties have not succeeded well and are not recommended for cultivation in this province:

1. Autumn Giant; 2. Globe Savoy; 3. Luxembourg; Dwarf Ulm Savoy.

Beets.

Sixteen varieties of beets were sown outside, with hand drill, on 14th May, in rows two feet apart, and all germinated well. In previous years the chief difficulty to be contended with, in connection with this crop was the tendency of the roots to grow too large for table use. This season, by leaving the plants somewhat thicker in the row and sowing the rows closer together, this difficulty was overcome, and the roots were all that could be desired for table purposes. A point deserving special mention, was the superiority of the long varieties over the round or turnip shaped, both in colour and texture. Although at present there seems to be some prejudice against the long beets, it is believed that, if they were more generally cultivated better appreciation would soon follow. On account of the earliness of the turnip-rooted varieties, a few of these should always be grown for early use. Another point observed in connection with this test, was the extremely poor quality of some of the varieties tried, a few being totally devoid of colour, and conspicuous among the latter class were those named The Lentz, Bassano Flat Red, and Eclipse. In the following table the varieties tested are arranged in the order of their productiveness.

Name of Variety.	Colour.	Shape.	Yield per Acre.
			Bush.
The Lentz	Poor, contains white rings	Turnip	1,358
Simmer's Extra Early	Very dark	Flat	847
Early Blood Turnip	Fair, contains white	Turnip	847
Eclipse	Very white	"	847
Whyte's Very Long Blood Red	Very dark	Long	836
Early Flat Red Bassano	White	Flat	814
Early Dark Red Egyptian	Very dark	"	792
Arlington Favourite Blood	"	"	715
Columbia	Fair, contains white	Turnip	715
Edmond's Blood Turnip	Dark	"	704
Dewar's Half-long Blood	Bright red	Half-long	660
Long Smooth Deep Blood	Very dark	Long	660
Extra Long Smooth Blood Red	"	"	616
Black Prince	"	Turnip	605
Olive Shaped Black Red	"	Olive shaped	440
Black Queen	"	"	383

The following are specially recommended as among the best:

1. *Simmer's Extra Early* (Turnip-shaped);
2. *Early Dark Red Egyptian* (Turnip-shaped);
3. *Dewar's Half Long Blood* (Half long);
4. *Long Smooth Deep Blood Red* (Long).

Cucumbers.

Cucumbers were an unqualified success this season, the yield and quality being fully up to if not above the average.

Twenty-five varieties were sown on 23rd May in hills 6 feet apart each way, and as soon as practicable the plants were thinned and reduced to three per hill. Until the vines commenced to spread, the soil was occasionally stirred with the horse cultivator, this being all the labour necessary. The method of sowing was as follows: One man with a hoe taking the lead made the holes at regular intervals; another followed dropping a small quantity of seed into the excavation, and with his foot drawing the soil together and pressing it firmly upon the seed. In this manner the work is performed rapidly, and has always been attended with excellent results. A feature to be regretted in connection with this crop was the astonishing mixture of varieties, some of them, especially the Japanese Climbing, producing three or four distinct types of fruit, making it difficult to select the typical variety. One of the earliest and most prolific varieties was Early Russian, a cucumber which should prove exceptionally valuable to market gardeners, on account of its ability to withstand constant pulling, the fruit forming very rapidly.

Giant Pera was the largest variety tested, and produced some magnificent fruit, perfectly straight, smooth and uniform of a beautiful light green colour, and possessing a fine flavour. The variety listed as Serpent proved to be merely a curiosity, and was entirely worthless for the table, although showing some most fantastic forms. The results of this test are below arranged according to earliness.

Name of Variety.	Ready.	Average Length.	Diameter.	Shape.	Flavour.	Average Weight.	Productiveness.
		in.	in.			oz.	
Russian Gherkin......	Aug. 15	....	....	Similar to Early	Russian.		
Early Russian...........	" 15	4½	2½	Small and sparsely spined.	Fair	8	Very productive.
White Spine............	" 17	7½	3	Straight, sparsely spined.	Very good....	8	"
White Wonder	" 17	6	2½	" ..	Excellent.....	10	"
Evergreen White Spine..	" 17	....	....	Similar to White	Spine.		
Early Cluster.........	" 19	6½	2¼	Crooked, sparsely spined.	Fair..........	10	Fairly productive.
Short Green Gherkin.....	" 20	5½	2	Straight, densely spined.	Good.........	8	Very "
Early Frame............	" 20	6½	2	Not uniform prominent spined.	Fair..........	8	Fairly "
Green Prolific...........	" 20	6	2¼	Straight, sparsely spines.	Good.........	8	" "
Arlington White Spine...	" 20	6	2½	Straight, prominent spines.	"	8	Very "
Boston Pickling.........	" 21	5	1½	Straight, densely spined.	"	6	Fairly "
Long Green.............	" 21	7½	2	Straight, sparsely spined.	"	12	" "
Cool and Crisp...........	" 21	8	2½	Tapering at neck, heavily spined.	"	10	" "
Extra Early Long Green.	" 21	8	2¼	Straight, prominent spines.	Very good....	10	Very "
Albino.................	" 22	6	2¼	Straight, sparsely spined,	Good........	10	Fairly "
Livingstone's Emerald...	" 22	8	2	Straight, densely spined.	"	11	" "
Nichol's Medium Green..	" 23	5	2¼	Straight, sparsely spined.	"	8	Very "

Test of Varieties of Cucumbers—*Concluded.*

Name of Variety.	Ready.	Average Length.	Diameter.	Shape.	Flavour.	Average Weight.	Productiveness.
		in.	in.			oz.	
Paris Pickling	Aug. 23	9	2	Heavily spined, twisted and corrugated.	Good	7	Very productive.
Giant Pera	" 24	14	$2\frac{1}{4}$	Straight, smooth	Excellent	18	" "
Japanese Climbing	" 25	...	....	This was unfortunately so mixed in type that no conclusions could be drawn.			
Giant White	" 25	11	$2\frac{1}{2}$	Twisted at neck, densely spined.	Very good	12	Not productive.
New Model	" 27	12	2	Straight, black spines.	"	14	"
Serpent	" 30	24	1	Crooked and pubescent.	Not palatable.	18	"
Pride of Canada	....	....	....	Did not germinate.			
Short Prickly	....	....	....				

List of varieties specially suitable for :—

SLICING.

White Wonder.
White Spine.
Cool and Crisp.
Extra Early Long Green.
Giant Pera.
Long Green.

PICKLING.

Early Cluster.
Short Green Gherkin.
Early Russian.
Paris Pickling.

VARIETIES NOT RECOMMENDED.

Giant White.
New Model.
Japanese Climbing.

Potatoes—Test of Various Divisions of.

Size of Division.	Percentage of Germination.	Weight Planted.	Weight of Large Harvested.	Weight of Small Harvested.	Total Weight.	Form of Tubers.
	p. c.	Ozs.	Lbs.	Lbs.	Lbs.	
Large, whole	100	$26\frac{2}{5}$	9	$3\frac{1}{2}$	$12\frac{1}{2}$	Irregular.
Whole, minus ends	100	16	8	$3\frac{1}{4}$	$11\frac{1}{4}$	Fairly regular.
Whole, small	100	$7\frac{1}{5}$	10	$1\frac{3}{4}$	$11\frac{3}{4}$	Very good sample.
Seed ends only	$96\frac{8}{27}$	$1\frac{5}{16}$	6	$\frac{3}{4}$	$6\frac{3}{4}$	Fairly regular.
Two eyes together	$73\frac{1}{3}$	$3\frac{7}{15}$	6	$\frac{3}{4}$	$6\frac{3}{4}$	Regular.
Three "	$89\frac{19}{29}$	$4\frac{28}{29}$	7	$\frac{1}{2}$	$7\frac{1}{2}$	Good sample.
Four "	$86\frac{2}{3}$	$6\frac{3}{5}$	7	$\frac{1}{4}$	$7\frac{1}{4}$	Irregular.
One eye separate	36	$1\frac{1}{5}$	$16\frac{1}{2}$	1	$17\frac{1}{2}$	"
Two eyes "	10	4	9	1	10	Fairly regular.
Three "	$23\frac{1}{3}$	$5\frac{1}{5}$	$7\frac{1}{2}$	$\frac{3}{4}$	$8\frac{1}{4}$	"
Four "	$23\frac{1}{3}$	$6\frac{2}{5}$	$13\frac{1}{2}$	1	$14\frac{1}{2}$	Irregular.

In the foregoing table the low percentage of germination in the small divisions show that these would not be as reliable during a dry season, the greater portion of them dying from dry rot, a fact proven by examination. On the other hand, the small sets which came to maturity, show by their comparatively heavy returns, that, in a moist season, they would probably have headed the list.

The Large whole potatoes, did not give a corresponding yield to the weight of tubers planted, and the result points to the inadvisability of planting very large sets. Small whole potatoes were more satisfactory, and give promise of furnishing in a favourable season means of disposing of some unmarketable potatoes. The result from seed ends only shows the error of a prevalent theory held in this vicinity, as to their worthlessness for seed purposes. Though the returns from these are not high, the fairly regular appearance of the product clearly shows that this portion may be used to advantage.

Onions.

The most important point brought out in the onion tests, was the superiority of the transplanted product over that from outside sowing. The manner in which this work was done here was as follows : The seed was sown in boxes in a hot-bed on 7th April, and on 20th April, was transplanted into boxes, setting the plants about one inch apart each way. After a gradual hardening off, they were transferred to the open ground on 13th May, a small dibler being used for this purpose. A thorough watering at this time completed the operation, although the yield is increased by this method, it is doubtful if it would pay growers to adopt this plan generally, on account of the somewhat low prices obtained for the crop. The yield of onions on the whole, was below the average, and they were later in maturing on account of the exceptionally dry spring.

Extra Early Red was the earliest variety, and Adriatic White Barletta proved to be a first class pickler, producing about 60 per cent of small uniform bulbs. The following results were obtained.

Onions sown outside in rows 14 inches apart on 11th April.

Name of Variety.	Pulled.	Ripened.	Colour.	Shape.	Yield per Acre.
	1898.	1898.			Bush.
Extra Early Red	Sept. 20	Sept. 26	Red	Flat	$339\frac{25}{60}$
Yellow Danvers	" 20	Oct. 5	Yellow	Globular	$320\frac{13}{60}$
Adriatic White Barletta	" 20	Sept. 20	White	Pickling	$153\frac{17}{60}$

Onions sown in hot-bed 7th April, transplanted into boxes 20th April, and planted outside 13th May.

Name of Variety.	Pulled.	Ripened.	Colour.	Shape.	Yield per Acre.
	1898.	1898.			Bush.
Exra Early Red	Sept. 15	Sept. 20	Red	Flat	390
Yellow Danvers	" 15	" 20	Yellow	Globular	$365\frac{18}{60}$

Pease.

The first five varieties in the following list, form a suitable succession of varieties for this province. Gradus and Prosperity are peas which are said to be earlier and better in quality than American Wonder. As tested here these two sorts seem to be identical.

The quality is certainly ahead of the American Wonder, but this advantage is offset by their lack of productiveness, and the fact of their being much later than American Wonder. All were sown in double rows, with hand-drill on 2nd May.

Name of Variety.	Ready.	Length of Pod.	Length of Vine.	No. of Peas in Pod.	Ratio of Productiveness.	Seed.
Alaska	July 10	2 inches.	14 inches.	4-5	5	Ripened.
Nott's Excelsior	" 8	2½ "	8 "	5-6	10	"
Horsford's Market Garden	" 18	4 "	24 "	8-9	10	"
*American Wonder						
Shropshire Hero	July 30	4 inches.	18 inches.	7-8	10	Ripened.
Gradus	" 18	4 "	18 "	5-6	5	"
Prosperity	" 18	4 "	18 "	5-6	5	"

* Similar to Nott's Excelsior.

BEANS.

Four varieties were sown on 21st May, in rows 2½ feet apart, and the result of the test is given below.

Name of Variety.	Ready.	Length of Pod.	No. of Beans.	Productiveness.	Seed.
Giant Dwarf Wax	August 15	6¼ inches.	4 inches.	Very.	Ripened.
Wardwell's Kidney Wax	" 20	7 "	5 "	Fairly	"
Golden Wax	" 15	6 "	4 "	Very.	"
Flageolet Scarlet Wax	" 23	7 "	5 "	"	"

CORN.

As will be seen from the following tabulated result, Cory corn from seed ripened here last season, was ready for use a few days earlier than from the imported seed. Attention is also called to the Improved Squaw Corn, as being a valuable variety for Manitoba. Sown on 21st May in rows 3 feet apart.

Name of Variety.	Ready.	Variety.	Length of Ear.	Flavour.	Seed.
			Inches.		
Cory (Own Seed, 1897)	Aug. 23	Dent	6½	Good	Partially ripened.
" imported	" 27	"	6½	"	"
Improved Squaw	" 18	Flint	7½	Fair	Ripened.

RADISH.

Two varieties of radish were sown on 25th April, viz.: Scarlet Olive Shaped and Brightest Long Scarlet, and were ready for use respectively on 3rd and 5th June. The unusual long period intervening between these dates, was occasioned by the very dry spring, which prevented prompt germination. Both were excellent varieties.

PARSNIPS.

The yield of parsnips was considerably above the average this season. The only variety tested was the Hollow Crown.

TOMATOES.

Three varieties of tomatoes were tested, and, none produced ripe fruit. The reasons assigned for this were, the imperfect fertilization of the early blossoms, coupled with the cool fall weather.

SQUASH.

We were favoured with an abundant crop of this vegetable, the yield and quality being exceptionally high. The variety known as Extra Early Orange Marrow deserves special mention as useful for Manitoba. It is very prolific, ripens early, and can be used either as a vegetable or for pies, making a pie quite equal to the pumpkin. This makes it very desirable, as the average season will not produce ripe pumpkins here except in very limited quantity. The outer color of this squash is a deep orange, and the flesh a clear lemon yellow. The bush varieties of squash have again shown their value in this próvince, and their superiority over most of the running forms.

LETTUCE.

Two varieties of lettuce were sown. Toronto Gem and Self Folding Cos on 11th April. On account of the dry spring, they were very late in arriving at maturity. A test has been made of fall sowing this season, and in this way we hope to have early lettuce next spring.

CAULIFLOWER.

Early Snowball, Large Erfurt and Autumn Giant, were the three varieties tested this season, and as in previous years, the first named was by far the best variety. Autumn Giant is too late for this vicinity, the heads not forming before frost.

CARROTS.

Carrots were only a fair crop this season, occasioned, principally, by delayed germination caused by the dry spring weather. Chantenay, Peer of All and Coreless, were the varieties tested. Chantenay headed the list, in shape flavour and yield.

TURNIPS.

Two varieties of garden turnips were sown, viz. : Extra Early Milan and Hazard's Swede. There was evidently an error in the name of the latter, as there was no similitude between Hazard's Swede as previously grown here, and that grown this season. Both were early garden strap-leaved turnips, and did not remain palatable for any length of time.

TOBACCO.

The variety grown this year was Connecticut Seed Leaf, and being a fairly early kind, it was hoped that ripened leaves would be harvested. The coolness of the season, however, prevented this, and the plants were frozen whilst in a green stage.

ASPARAGUS.

Asparagus continues to give satisfaction. All varieties under cultivation, are in good condition, and improving yearly. This vegetable requires very little attention, and is a strong and free grower and one of the most acceptable delicacies of its season for the table.

MUSK MELON.

Three varieties of melons were tested: Yellow Cantaloupe, Banquet and McCotter's Pride. None produced ripe fruit, Yellow Cantaloupe approaching nearest to ripeness.

CELERY.

Four varieties of celery were tested this season, viz.: White Plume, Imperial, Giant Pascal and London Prize Red, and all grew well. Hilling was accomplished by using drain tiles, no soil being thrown up whatever. The product was well blanched, and of excellent flavour and more crisp than any previously grown here by the soil-hilling process. Celery growers would do well to give this method a trial.

THE FLOWER GARDEN.

The flower garden during the past season was an unqualified success, and the profusion of bloom during the summer months, attracted much attention from visitors. The mixed border was especially admired, the combination of the various colours of annuals and perennials forming a very pleasing picture. One of the most noticeable of the new varieties of annuals tested was *Chrysanthemum inodorum plenissimum*, a very free blooming double white variety, and hardy enough to continue in bloom for a considerable time after frost. It possesses a special value as a cut flower, on account of its long slender stems, and keeping qualities.

Asters, we regret to say, were again a decided failure, and produced about 90 per cent of deformed blossoms. Unless a remedy for this disease is found it may be better to discontinue the cultivation of this hitherto most valuable annual. The herbaceous perennials made a good showing, and attention is called to some of the more recent introductions at this farm on a later page.

Following is a list of the annuals tested. They were sown in boxes in hot-bed on 11th April, transplanted 18th to 25th April, and planted outside 7th to 14th June.

Name of Variety.	Flowering Period.
Asters (7 types)	July 15 to frost.
Phlox Drummondii	June 15 "
Verbena auriculæflora	" 18 "
Salpiglossis variabilis	" 30 "
Zinnia elegans	" 15 "
Antirrhinum Queen of North	" 25 "
" Half High	" 25 "
" Tom Thumb	" 25 "
Stocks (3 types)	" 14 "
Petunia, Double	" 25 "
" Single	" 15 "
Gaillardia grandiflora Hybrida	Aug. 12 "
" *picta*	June 25 "
" *Lorenziana*	" 25 "
Chrysanthemum inodorum plenissimum	" 20 "
Nigella damascena alba	" 20 "
Acrolinium roseum	" 7 "
Datura Henherriana	July 20 "
Brachycome iberidifolia	June 15 "

The following annuals were sown outside on 26th May, 1898, and not transplanted.

Name of Variety.	Flowering Period.
Poppies Peony flowered	June 20 to frost.
" The Shirley	" 20 "
Mignonette mixed	" 25 "
Nasturtium Dwarf	July 5 "
Portulaca mixed	" 20 "
Linum roseum	June 30 "
Godetia mixed	July 5 "
Calliopsis mixed	June 30 "
Sunflower Dwarf	" 25 "
Sweet Peas mixed	July 15 "

Herbaceous Perennials.

On page 352 of last year's report, a list of perennials was given, which had withstood one winter only, and whose hardiness could not be positively stated. Following is a list of those varieties which have withstood the winter of 1896-97, and may perhaps be accounted hardy for this province.

1. Lychnis Haageana Hybrids.
2. Hemerocallis flava.
3. Hesperis matronalis.
4. Polemonium reptans.
5. Baptisia australis.
6. Orobus lathyroides.
7. Gypsophila paniculata.
8. Asclepias tuberosa.
9. Stenactis speciosa.
10. Alyssum argenteum.
11. Lychnis Chalcedonica alba.

The varieties mentioned on page 352 of last year's report, some of which date back from 1893, are alive with one exception, viz.: *Anthemis coronaria*, which died during the past winter.

Of the roses mentioned on page 353 of last year's report, the following are alive at this date (November, 1898):

1. Baron Prevost, flowered 1898.
2. Mad. Plantier, did not flower.
3. Gem of Prairies, do
4. From A. P. Stevenson, Nelson, flowered 1898.

All of the above have made excellent growth during the past season, and are in good condition for winter.

Hyacinths.

The hyacinths mentioned in last year's report as having survived the winter of 1896 by heavy covering, came through last winter with the aid of an ordinary manure mulch.

Collection of Herbaceous Perennials.

This collection has been added to considerally, and now comprises a large number of species and varieties. A number of native perennials, which were located during the summer, have been lifted this fall, and will be planted in the spring.

Iris Hispanica.

This beautiful iris has, in all previous tests, succumbed to the severity of our winters. Last fall, one bulb each of 10 varieties, was planted, and protected in a simi-

lar manner to the Hyacinths, tar-paper, and a very heavy covering of manure being given. All came up in the spring and flowered well thus showing that by heavy covering, these bulbs may be successfully cultivated in Manitoba.

Twenty-five varieties of *Japanese Iris* (*Iris Kœmperi*), and 14 varieties of *Japanese Peonies*, were received from the Central Farm in the fall of 1897, and planted in the collection of Perennials. All came through alive last spring, and some of the Irises flowered, making a valuable acquisition to the stock of Perennials.

The following plants were received from the Central Farm on July 25th, 1898. As fall planting has proven unsatisfactory, these were put into a cold frame on arrival, and will be transferred to permanent location in the spring.

Iris amoena Verschur.	*Campanula Carpatica.*
" *plicata Gisele.*	*Ajuga genevensis.*
" *squalens Tristesse.*	*Achillea ptarmica fl Pl.*
" *neglecta Salvatori.*	*Lysymachia Clethrifolia.*
" *squalens Tarquin.*	*Epimedium rubrum.*
" *variegata Coquette.*	*Spiraea venusta.*
" *plicata Lord Seymour.*	" *ulmaria.*
" *Florentina.*	*Rudbeckia laciniata.*
" *variegata Henry Havard.*	*Hemerocallis graminaefolia.*
" " *Souvenir.*	" *Kwanso fl. Pl.*
Polemonium reptans.	" *disticha.*
Doronicum plantagineum excelsum.	" *Dumortieri.*
Achillea millefolium rubrum.	" *fulva.*
Phlox subulata Newry Seedling.	" *Thunbergii.*
" *decussata Dwarf white.*	

LILIES.

The following lilies were received from the Central Farm in 1897, and planted in the collection of Herbaceous Perennials. All came through the winter, and two flowered. This is a valuable addition to the list of perennials here, no special covering was used for protection.

Lilium davuricum Sappho.	*Lillium Kamschatkensis.*
" *elegans transiens.*	" *elegans fulgens Batemani.*
" *callosum.*	" *Concolor.*
" *Leichtlinii*	" *Krameri.*
" *Hansoni.*	

Ninety-three varieties of Perennial Flower seeds were received from the Central Farm at Ottawa during the winter of 1897. These were sown in seed beds in the spring of 1898, and 38 varieties germinated. As these seeds were gathered from plants growing at the Central Farm, it may be presumed that the low germinating power was caused by their not being fully ripened.

DISTRIBUTION OF SEED GRAIN, POTATOES, &c.

The distribution of both three-pound samples and larger lots of grain has increased this year, and many favourable reports have been received from parties supplied.

The following quantities were sent out to applicants :—

Wheat, two bushels or more	16
Oats " "	7
Barley " "	37
Grain of all kinds in three-pound bags	361

DISTRIBUTION OF POTATOES, &c.

Potatoes in three-pound bags	129
Maple seed, one pound "	165
Flower seed, packages	121
Rhubarb roots, "	71
Vegetable seed, "	46
Perennial flowering plants, packages	79
Trees and cuttings, packages	1,237

NEW BREAKING.

The thirty-seven acres of new breaking mentioned on page 354 of last year's report gave a very satisfactory crop, a portion of it yielding sixty-three bushels of barley per acre; evidently disc-harrowing of tough sod after backsetting is a benefit.

During the past summer thirty-five additional acres have been broken and backset; thirteen acres of this was an old pasture field of native sod where the grass was nearly run out. It is proposed to use this field for grain for two or three years, and then seed it down again to grass.

BUILDINGS.

No new buildings have been erected during the past year, but the barn and driving shed have been repainted, and transom windows placed over the doors of the cattle and horse barn. This latter improvement provides for much better ventilation.

BARN-YARD MANURE.

Many farmers complain of inability to properly rot barn-yard manure in this country. Several hundred loads of excellent manure is made on this farm each year, and successfully rotted by the following method:—

The long, strawy manure, fresh from the stable, is drawn into a depression situated a short distance from the barn, and spread in layers about a foot thick, care being taken that the pile is commenced early in the fall, so as to start fermentation before very cold weather sets in. As the snow drifts on manure it is melted by the heat produced from the fermentation, and this aided by the rains of summer thoroughly saturate the pile, and in the following fall the manure is so well rotted that it can be cut with a spade; whereas if left in a conical pile above the surface of the ground in the dry seasons, which prevail here, it will often dry out and fail to ferment.

Experiments have been tried here with fresh manure, drawing it directly from the barns to the field, but so far this plan has proved a failure, the manure dries up and fails to rot, and is in that shape difficult to plough under.

Better success has been had with such manure when cut straw has been used for bedding, but it was found that more straw was required when this plan was adopted, and that it entailed a great deal of extra labour.

FARMERS' MEETINGS.

Work in this connection has increased very much of late years, and as many meetings are attended as is practicable with the limited time at my disposal. It is not possible to accept nearly all the invitations received to speak at farmers' gatherings.

Since my last report twenty-five meetings have been attended, many of the places mentioned in the following list were visited in succession during the one trip, thus saving both time and money. The average attendance was larger than usual this year.

Jan. 31, Bird's Hill,
Feb. 1, Kildonan,
" 2, Morris,
" 3, St. Jean Baptiste,
" 4, Manitou,
" 5, Nelson,
" 12, Wawanesa,
" 18-19, Winnipeg,
" 22, Oak Lake,
" 24, Virden,
" 25, Elkhorn,
March 1, Oak River,
March 1, Arrow River,
" 2, Birtle,
" 4, Neepawa,
" 9, Oak Lake,
" 10, Elkhorn,
" 16, Portage la Prairie,
June 28, Souris,
" 28, Pipestone,
" 29, Hartney,
" 30, Melita,
July 1, Deloraine,
" 7, Brandon,
June 28, Reston.

METEOROLOGICAL RECORD.

Month.	Highest Temperature.	Lowest Temperature.	Total Rainfall.	Depth of Snowfall.	Total Amount of Sunshine.
1897.			Inches.	Inches.	Hours.
November	57° above zero on 2nd	26° below zero on 27th	....	$20\frac{1}{2}$	$107\frac{5}{10}$
December	36° " 28th	30° " 18th	....	$6\frac{1}{2}$	$90\frac{7}{10}$
1898.					
January	30° " 5th	26° " 31st	....	$11\frac{1}{4}$	$120\frac{4}{10}$
February	38° " 12th	32° " 18th	....	$12\frac{1}{2}$	$127\frac{8}{10}$
March	36° " 12th	19° " 22nd	....	$2\frac{3}{4}$	$130\frac{4}{10}$
April	81° " 26th	2° above zero on 2nd	....	....	$217\frac{8}{10}$
May	87° " 24th	21° " 11th	$\frac{1}{4}$	$\frac{1}{2}$	$264\frac{5}{10}$
June	95° " 18th	29° " 14th	$3\frac{1}{2}$	....	$190\frac{1}{10}$
July	93° " 13th	39° " 31st	$5\frac{1}{2}$	....	$253\frac{9}{10}$
August	88° " 19th	33° " 12th	$2\frac{1}{4}$	....	$249\frac{6}{10}$
September	89° " 27th	25° " 9th	$2\frac{1}{4}$	....	$186\frac{2}{10}$
October	55° " 11th	9° " 30th	$2\frac{3}{4}$	$2\frac{3}{4}$	$90\frac{5}{10}$
	Total, 1898	....	$16\frac{1}{2}$	$56\frac{3}{4}$	$2,029\frac{4}{10}$
	" 1897	....	$6\frac{1}{2}$	$75\frac{1}{2}$	$1,968\frac{6}{10}$

CORRESPONDENCE.

The correspondence of this office again shows an increase. This year 4,670 letters were received, and 3,584 dispatched, irrespective of 1,804 circulars sent out.

I have the honour to remain, sir,
Your obedient servant,

S. A. BEDFORD,
Superintendent.

EXPERIMENTAL FARM

FOR THE

NORTH-WEST TERRITORIES

REPORT OF A. MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.,
30th November, 1898.

To WM. SAUNDERS, Esq.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith to you the eleventh annual report of the operations on the Experimental Farm for the North-west Territories at Indian Head, Assiniboia, during the year 1898.

The past season has been one of bright promises and fair fulfilment. Last winter, like that of 1896-7, was fine; snow was abundant and cold not excessive. The spring, however, was backward and a cold snap following a heavy fall of snow in the latter part of March and first week of April was the cause of considerable loss to stockmen throughout the Territories.

Spring opened about the middle of April and the weather continued fine until seeding was completed.

Some districts had sufficient moisture to cause early and even germination of the seed: others, however, were lacking in this respect but rains later on made up the deficiency in time to ensure a fair and in many cases a good crop.

Winds, though by no means entirely absent, were not very troublesome during the growing season and the loss from this source was small in comparison with that of previous years.

Rains, during the months of May and June, were sufficient to cause satisfactory growth, except in a few districts where the rainfall was below the average, but the heavy downpour necessary to rush the growth was absent until about the middle of July. The grain received a set-back during this month by a week of excessively hot weather but was saved from serious injury by subsequent heavy rains. In addition to the excessive heat and heavy rains in the month of July, there were several drops in the temperature which came dangerously near the freezing point and in some instances caused the grain to be blighted.

Harvest, however, came early with a promise of exceptionally good yields in nearly every district throughout the Territories. The harvest was a tedious one on account of the heavy and continuous rainfall, and it is safe to say that in no previous year in the grain growing history of the country has there been witnessed such a long period of rain and unfavourable weather during the usually fine months of September and October.

Never before has the land been so wet in the fall and in no previous year have the farmers been at so much trouble and expense in securing their crops. While all found it a tedious and expensive undertaking, many rushed the stacking and where this part of the work was well done were safe; others, however, risked threshing from the stook and have paid the penalty in delayed threshing and lower grades, if not seriously damaged grain.

Weeds, especially lamb's quarters (*Chenopodium album*) were more numerous than ever and in many cases were the cause of considerable loss to grain-growers. The more dangerous varieties such as Stink Weed (*Thlaspi arvense*), Tumbling Mustard (*Sisymbrium altissimum*) and Hare's Ear Mustard (*Conringia orientalis*) are extending in all directions. It is, however, gratifying to note the increased amount of attention they are receiving at the hands of individual farmers, Municipal Councils and the North-west Government.

The crops on the Experimental Farm have, with the exception of the hay crop, been very satisfactory. Wheat, oats, barley and pease gave excellent yields. The samples of some varieties of wheat and oats are not equal to those of last year while others are better. Roots and vegetables, especially potatoes, gave good yields and were of excellent quality.

The exceedingly dry fall of 1897 and an insufficiency of moisture early this spring combined to cause a light crop of hay. This fall, however, a good crop of pasture has been produced by the heavy rains, and with the present wet condition of the ground a good crop of hay is looked for next year.

Fruits of both wild and cultivated varieties were a poor crop. Frost in May ruined the blossoms of everything except red and white currants, raspberries and gooseberries. Native fruits were very scarce in many localities, while in others raspberries were an abundant crop.

Needless to say, with the overabundance of rain, trees made a most vigorous growth. Whether the growth has been too vigorous or has extended too late in the season, cannot be determined till next spring. It is probable, however, that such has been the case and that many varieties of trees will suffer greatly through the action of frost on the imperfectly matured wood.

Cattle throughout the Territories have done exceedingly well the past season. While many came through last winter very thin, the abundance of pasture during the grazing season has put all in good condition. Flies were less troublesome than usual. Good prices have been obtained for export beef and on local markets.

EXPERIMENTS WITH SPRING WHEAT.

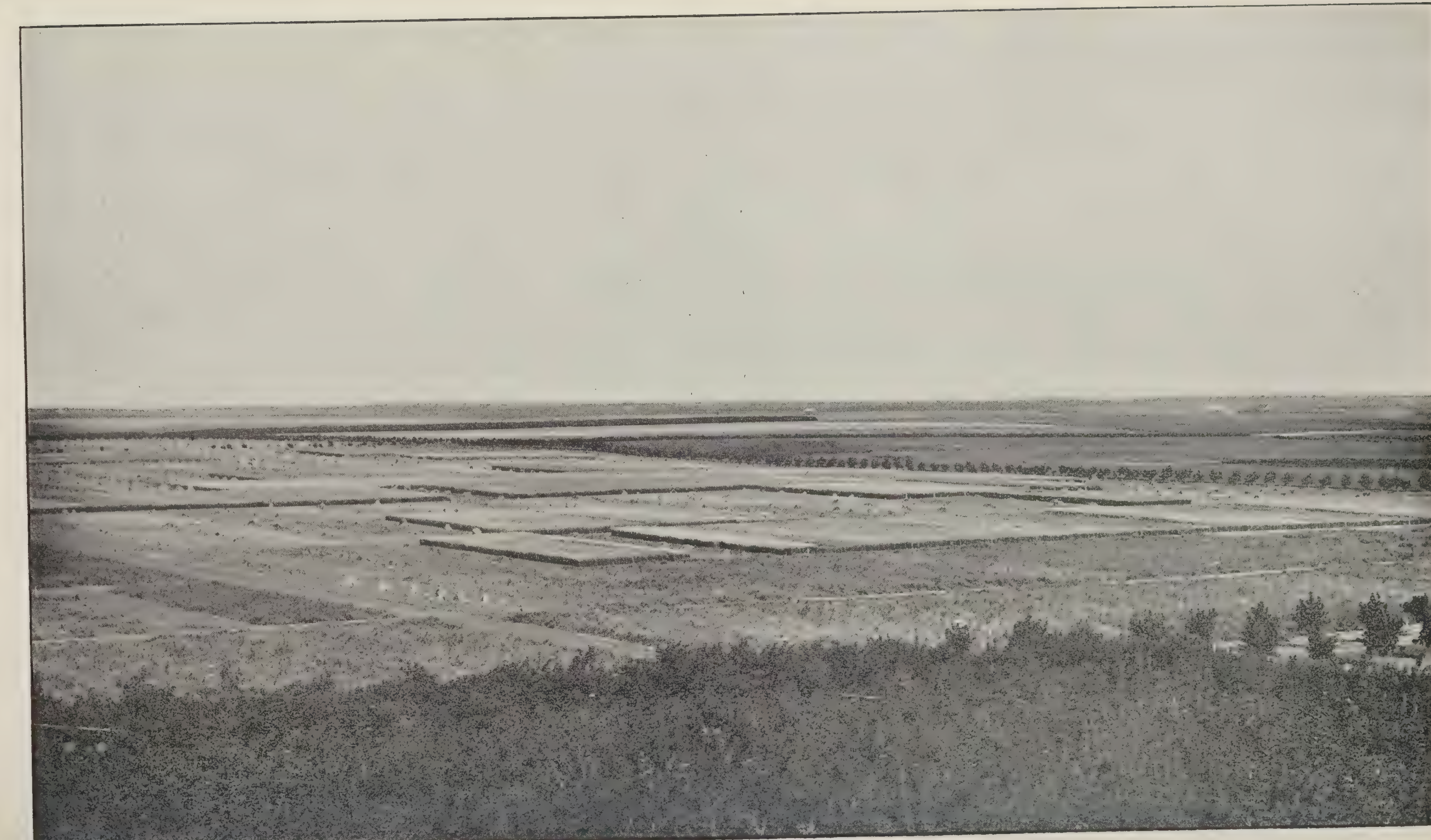
Forty-two varieties of wheat were tested in $\frac{1}{10}$th acre plots, eight of the same varieties again on plots of one acre each, and six varieties on fields of from two to six acres.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Red Fife and Stanley were used in this test. The soil was clay loam. The land had been fallowed in 1897 and was in good condition when sown. The seed was sown by hoe-drill, at rate of one and one-half bushels per acre. The first plots were sown on 16th April and six successive sowings were made one week apart, the last plots being sown on 21st May. All seedings came up evenly and ripened and were harvested in the order sown.

The first three seedings of both varieties gave the highest yield and were much superior in quality to the later plots. The result of the test is practically the same as in 1896 and 1897.

The crops from the last two seedings of Red Fife and the last seeding of Stanley were quite green when frost came on 8th September, and although the yield was not affected, the sample was more or less damaged. There was no rust on any of these plots.



General view of Experimental Farm at Indian Head, N.W.T., showing Experimental Plots and Fields of grain.

Wheat—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre	Yield per Acre.		Weight per Bushel.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
Red Fife	Apl. 16.	Aug. 22.	129	34	Strong .	3	Bald ...	3,300	45		64
"	" 23.	" 26.	126	36	" .	3	" ..	3,850	42	30	63½
"	" 30.	Sept. 2.	126	41	" .	3	" ..	4,110	43	10	64
"	May 7.	" 5.	122	42	" .	3	" ..	3,270	40	30	63½
"	" 14.	" 5.	115	44	" .	3	" ..	3,500	40	50	60¼
"	" 21.	" 9.	112	43	" .	3	" ..	5,180	44	30	59
Stanley	Apl. 16.	Aug. 19.	126	39	" .	3¼	" ..	4,090	41	50	63
"	" 23.	" 23.	123	38	" .	3¼	" ..	3,400	35		62½
"	" 30.	" 26	119	38	" .	3¼	" :	3,790	36	50	62
"	May 7.	Sept. 3.	120	43	" .	3¼	" ..	4,120	33	50	63¼
"	" 14.	" 5.	115	44	" .	3¼	" :	4,180	32		63
"	" 21.	" 9.	112	43	" .	3¼	" ..	4,060	30	40	59¼

WHEAT—TEST OF VARIETIES ON FIELDS OF ONE TO SIX ACRES.

As heretofore, in these tests the more promising varieties of wheat grown in previous years were sown in field lots, not only to test the grain on larger areas, but for the purpose of obtaining seed in quantities for distribution of samples and for sale for seed.

The plot of Hungarian wheat was in a low portion of the field, and suffered in yield and sample from a cold wave in August.

The soil was clay loam; the seeding was done by hoe-drill at the rate of one and one-half bushels per acre in all cases. The 8 acres of Red Fife was on summer-fallowed land; the 4 acres was sown after roots, and the 1¾ acres on Brome grass sod broken and back-set.

Wheat—Field Lots.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
				Ins.	Ins.		Lbs.	Bus.	Lbs.	Lbs.
8 acres Red Fife	April 16..	Aug. 26..	133	34	3	Bald.	4,000	32	7	62½
4 " "	" 15..	" 20..	128	30	3	"	3,820	24		62½
1¾ " "	" 16..	" 19..	126	28	3	"	3,300	20		62½
1½ " Hungarian..	" 19..	" 29..	133	34	3	Bearded..	4,110	34	50	61
4 " Preston....	" 19..	" 24..	128	36	3¼	"	4,630	32	30	63
4 " Wellman's Fife.....	" 18..	" 31..	136	39	3¼	Bald	4,800	29	45	62⅓
2 " Stanley.............	" 19..	" 29..	133	36	3¼	"	4,720	28		62½
2 " Percy	" 19..	" 29..	133	36	3¼	"	4,300	25		62¼

Wheat—Acre Plots.

Red Fern	April 19..	Aug. 29..	133	42	3½	Bearded. .	4,950	39	15	62
White Connell..	" 19..	" 31..	135	40	3	Bald.	4,200	34	23	62¼
White Russian.	" 19..	" 31..	135	40	3½	"	4,330	30	43	62¼
Herisson Bearded............	" 19..	" 31..	135	38	2	Bearded. .	3,750	29		62
Beauty................	" 19..	" 29..	133	40	3¼	Bald.	3,570	28	40	61
White Fife..................	" 19..	" 31..	135	40	3¼	"	4,200	28	30	63
Dawn................... ...	" 19..	" 29..	133	34	2½	"	3,110	26	5	61

SPRING WHEAT—TEST OF VARIETIES IN UNIFORM PLOTS.

Forty-two varieties were sown on April 21 on $\frac{1}{10}$th acre plots of summer-fallowed land, by hoe-drill, 3 inches deep, and at the rate of one and one-half bushels of seed per acre. The soil was clay loam. The crop of straw was not excessive on any of the plots, and the yield of grain was rather better than last year. Some of the samples, however, were not so good, caused, no doubt, by the hot weather in July. There was no rust on any of these varieties.

SPRING WHEAT.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre	Yield per Acre.		Weight per Bushel.
			Ins.		Ins.		Lbs.	Bush	Lbs.	Lbs.
White Fife	Sept. 3..	136	36	Strong ...	3	Bald	4,020	45	30	62
Percy	Aug. 23..	125	34	Medium..	2½	"	3,930	45	20	63
Red Fife	Sept. 3..	136	37	Strong ...	3	"	4,490	44	20	63
Monarch	Aug. 26..	128	34	Medium..	2¾	"	4,200	43	20	63¼
Stanley	" 23..	125	34	Strong ...	3¼	"	3,410	43	10	63
Wellman's Fife	Sept. 3..	136	36	" "..	3	"	3,510	43	10	62
White Connell	" 2..	135	37	" ...	3	"	4,840	42	30	63
Captor	Aug. 26..	128	36	" ...	3	"	4,090	42	30	63¼
White Russian	Sept. 3..	136	41	" ...	3½	"	4,650	42	20	61
Preston	Aug. 26..	128	34	" ...	3	Bearded..	4,360	42	10	63
Crown	" 25..	127	36	" ...	3	Bald	4,670	41	20	63¼
Progress	" 23..	125	34	Medium..	3	"	4,680	40	20	62½
Campbell's White Chaff	" 25..	127	36	Strong ...	2¾	"	5,270	39	40	63
Dion's	Sept. 5..	138	41	" ...	3½	Bearded..	4,920	39	40	62
Emporium	Aug. 26..	128	40	" ...	3¾	"	4,070	38	50	62
Beauty	" 25..	127	36	Weak	3½	Bald	4,330	38	40	62
Advance	" 26..	128	38	Strong ...	3¼	Bearded..	4,830	38	40	61
Blenheim	" 26..	128	38	" ...	3	"	3,510	37	20	61½
Black Sea	" 23..	125	36	" ...	2¾	"	3,550	36	40	62
Rio Grande	" 27..	129	38	" ...	2¾	"	3,920	36	20	60¼
Red Fern	Sept. 5..	138	40	" ...	3½	"	4,520	36	20	60
Old Red River	Aug. 25..	127	36	" ...	3	Bald	3,680	36	10	63
Beaudry	" 26..	128	39	Weak	2¾	Bearded..	3,950	35	50	61
Dawn	" 23..	125	32	"	2½	Bald	3,020	35	30	63
Dufferin	" 26..	128	32	"	2½	Bearded..	3,200	35	..	62½
Hungarian	" 23..	125	35	Strong ...	2¾	"	3,420	34	40	61
Vernon	Sept. 5..	128	36	" ...	2½	"	4,000	34	30	58½
Admiral	Aug. 25..	127	38	" ...	3¼	"	4,140	34	20	63
Goose	" 26..	128	36	Medium..	2¼	"	3,360	34	20	63
Rideau	" 26..	128	34	" ...	3	Bald	2,160	34	..	60½
Golden Drop	" 25..	127	36	Strong ...	2½	"	3,950	33	30	62½
Countess	" 23..	125	33	Weak	2½	"	3,190	32	40	62
Huron	" 25..	127	38	Strong ...	3¼	Bearded..	2,600	32	30	63½
Pringle's Champlain	" 23..	125	33	" ...	3¼	"	2,590	31	50	64
Alpha	" 23..	125	36	" ...	3	"	2,740	31	..	63½
Blair	" 24..	126	31	Medium..	2½	Bald	3,300	30	..	61
Herisson Bearded	" 26..	128	36	Strong ...	1¾	Bearded..	3,170	28	50	63¼
Mason	" 19..	121	33	" ...	2¾	Bald	3,460	27	20	63
Colorado	" 26..	128	36	" ...	3	Bearded..	3,280	27	..	61
Harold	" 16..	118	32	Weak	2½	"	3,600	26	40	62
Ladoga	" 24..	126	36	Strong ...	2½	"	3,380	23	40	60¾
Plumper	" 24..	126	32	" ...	2½	"	3,500	21	40	61

Wheat.—Test of sowing seed at different depths, sown by hoe-drill on fallow, April 22; soil, clay loam; plots, $\frac{1}{10}$th acre each; sown at rate of $1\frac{1}{2}$ bushels per acre.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bush.	Proportion Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Red Fife, 1 inch deep	Aug. 27	128	38	Strong..	3	Bald .	4,440	35	10	61	No rust.
" 2 "	" 27	128	38	" ..	3	" ..	3,780	32	..	61	"
" 3 "	" 27	128	38	" ..	3	" ..	4,060	34	..	62	"

Average crop for seven years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		1898.		Average.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Red Fife, 1 inch deep........	....	....	....	....	....	....	....	....	38	30	40		35	10	37	53
" 2 "	27	..	41	20	15	20	45	..	39	15	40	40	32	..	34	22
" 3 "	22	30	37	10	18	..	37	30	38	50	33	50	34	..	31	41

Note.—It will be noticed in the above that only three trials have been made of seeding one inch deep, and as the years in which the tests have been made were particularly favourable, on account of the large amount of rainfall, for this depth of seeding the average cannot be fairly compared with those of the deeper seedings.

Wheat.—Test of sowing different quantities of seed per acre, sown April 22, on clay loam, summer-fallowed, by hoe-drill, 3 inches deep; plots, $\frac{1}{10}$th acre each.

Name of Variety.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bush.	Proportion Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Red Fife, 1 bush. per acre	Aug. 27	128	40	Strong..	3	Bald .	5,000	34	50	$62\frac{3}{4}$	No rust.
" $1\frac{1}{4}$ " ..	" 27	128	40	" ..	$3\frac{1}{4}$	" ..	3,450	39	10	62	"
" $1\frac{1}{2}$ " ..	" 27	128	38	" ..	$3\frac{1}{4}$	" ..	4,310	42	10	62	"

Average crop for seven years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		1898.		Average.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Red Fife, 1 bush. per acre....	35	50	28	20	14	30	35	50	38	30	38	30	34	50	32	20
" $1\frac{1}{4}$ "	40	..	28	..	11	40	44	..	40	10	38	50	39	10	34	33
" $1\frac{1}{2}$ "	39	40	26	30	13	20	42	20	38	20	38	40	42	10	34	26

WHEAT.—Test of Press *vs.* Hoe-drill, sown April 22, on clay loam, summer-fallowed, at rate of 1½ bushels per acre; plots, $\frac{1}{10}$th acre each.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bush.	Proportion Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Red Fife, sown by press-drill	Aug. 24	125	37	Strong	3	Bald	3,440	42	40	63½	No rust.
Red Fife, sown by hoe-drill	" 27	128	38	"	3	"	5,010	45	40	62¾	"

AVERAGE crop for seven years.

Name of Variety.	1892.		1893.		1894.		1895.		1896.		1897.		1898.		Average.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Red Fife, press-drill	30	20	38	20	18	40	45	..	41	30	41	..	42	40	36	47
" hoe-drill	24	..	36	18	17	50	44	..	40	40	39	..	45	40	35	21

BLUESTONE AS A REMEDY FOR SMUT IN SPRING WHEAT.

In this test ordinary clean Red Fife seed and very smutty seed were used. The smutty seed was the product of very smutty seed sown without treatment the year previous, and was unfit for any purpose whatever.

Variety of Seed.	Condition of Seed.	Treatment.	Yield per Acre.		On 25 Sq. Feet.	
					Good Heads.	Smutty Heads.
Red Fife	Clean seed	Bluestoned, 1 lb. to 10 lbs	35	40	1,123	0
"	"	Untreated	35	..	1,126	12
"	Smutty seed	Bluestoned, 1 lb. to 10 lbs	31	10	1,137	34
"	"	Untreated	15	20	388	687

For the above test bluestone was dissolved and mixed with water at the rate of one pound to 2 pails of water. In this solution the seed was dipped. For smutty seed one pound of bluestone was used for six bushels: for clean seed one pound to ten bushels.

FALL WHEATS.

Nine varieties of fall wheat were sown in one of the hedged enclosures on the 21st of September, 1897. All the varieties were above ground when winter set in and came through the winter and spring safely. All made a rank growth and from the large heads formed gave promise of a very heavy yield. Rust, however, struck the straw when the heads were partially filled, causing a very light yield of very poor grain. The soil was clay loam, and the size of the plots $\frac{1}{10}$th acre each. A large snow bank cov-

ering the grain during the winter and the absence of severe spring frosts until the roots had became thoroughly established, accounts for this crop coming through the winter safely.

Name of Variety.	Date of Ripening.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
		Inches.		Inches.		Bush.	Lbs.	Lbs.	
Diamond Grit	Aug. 19	44	Strong .	3	Bearded..	9	..	57¼	Badly rusted.
Dawson's Golden Chaff.	" 19	45	" ..	4	Bald	10	30	50	"
Early Arcadian	" 19	42	" ..	3	"	10	10	55¾	"
Cony Amber..........	" 19	46	" ..	4½	"	9	30	54	"
Red Genessee Giant...	" 19	40	" ..	3	Bearded..	12	..	53	"
Bearded Winter.. ...	" 19	42	" ..	3½	" ..	12	10	54	"
Red Clawson..........	" 19	44	Medium	3¼	Bald	15	..	58	"
Pride of Genessee.....	" 19	45	" ..	3½	Bearded..	10	..	55¾	"
New Longberry........	" 19	45	" ..	3½	" ..	10	30	55¾	"

EXPERIMENTS WITH OATS.

The oat crop this year was not as heavy as that of 1897, caused by spring frosts which twice cut back the various plots, killing a very considerable number of the young plants of the more tender varieties. In several plots from one-third to one-half of the plants were destroyed. All the varieties were thus kept back and ripened much later than usual. In addition to this pigweed obtained a good start, and in several of the acre plots helped to decrease the yield.

The land sown to oats had all been summer-fallowed in 1897, which work consisted of one deep ploughing in May or early in June, and several surface cultivations during the growing season by means of which all weeds were kept in check.

TEST OF EARLY MEDIUM AND LATE SOWINGS.

Banner and Abundance oats were used in this test. The sowings were one week apart and continued from 23rd April to 28th of May. The soil was clay loam, and the size of the plots $\frac{1}{10}$th acre each. The last sowing of Banner and the two last of Abundance were overtaken by frost before maturity, but as the grain was almost ripe very little shrinkage took place. There was no rust on any of these plots.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bus	Lbs	Lbs.
Banner...........	April 23	Aug. 22	122	48	Strong..	8	Branching	4,440	81	6	42
"	" 30	" 26	119	48	" ..	8	"	3,510	81	16	40½
"	May 7	Sept. 3	120	45	" ..	8	"	4,080	88	28	40
"	" 14	" 5	115	45	" ..	8	"	3,970	83	8	38
"	" 21	" 6	109	45	" ..	8	"	2,910	83	18	39
"	" 28	" 12	108	48	" ..	8	"	3,600	79	14	36
Abundance.........	April 23	Aug. 27	127	40	" ..	8	"	2,490	69	14	39
"	" 30	Sept. 3	127	42	" ..	8	"	3,390	64	14	41½
"	May 7	" 6	123	42	Medium	8	"	3,010	65	10	39
"	" 14	" 12	122	45	Weak ..	8	"	3,280	88	8	38
"	" 21	" 12	115	46	" ..	8	"	3,950	85	10	38
"	" 28	" 12	108	45	" ..	8	"	3,900	79	14	37

OATS—FIELD LOTS.

Twelve varieties were sown on fields of one-half to fifteen acres each.

Banner, Abundance, Improved Ligowo and Holstein Prolific gave very heavy crops of straw and with the exception of Improved Ligowo which was badly eaten by blackbirds, yielded well.

The oat plots, large and small, were continually covered with the birds from the time the first heads became ripe until the grain was drawn in and threshed. The plot of Improved Ligowo being near a large dam, suffered more than the other varieties.

All plots were sown on clay loam by hoe-drill at the rate of 2½ bushels per acre. There was no rust on any of these varieties.

Oats—Field-Lots.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
	Acres.				In.		In.		Lbs.	Bush	Lbs	Lbs
Banner	15	April 26	Aug. 27	124	46	Strong..	8	Branching	4,310	85	..	38
Abundance....	10	" 28	" 30	125	46	" ..	8	"	4,150	82	..	40
Holstein Prolific	1¼	" 30	" 30	123	42	" ..	8½	"	3,810	80	..	40
Bavarian..	2	May 4	Sept. 11	131	48	Medium	8	"	5,000	77	17	39
Columbus............	2	April 29	Aug. 30	124	42	Strong..	7	"	3,650	69	..	37
Improved Ligowo.....	1¼	May 4	Sept. 6	126	54	Medium	9	"	4,100	50	..	40½
American Beauty.....	½	April 29	Aug. 30	124	44	Strong..	8	"	3,840	70	..	38
Siberian....	½	" 29	" 30	124	44	" ..	9	"	3,610	68	..	37
Bonanza	½	" 29	" 30	124	46	" ..	8	"	3,350	67	24	41
White Schonen.......	½	" 29	" 30	124	40	" ..	8	"	3,110	67	4	40¼
Wide Awake..........	½	" 29	" 27	121	44	" ..	8	"	4,000	66	30	40
Welcome.............	½	" 29	" 30	124	46	" ..	8	"	4,100	53	4	43

OATS.—TEST OF VARIETIES.

Sixty-four varieties were tested on plots of $\frac{1}{10}$ acre each. A number of the plots were injured by spring-frosts and were consequently late in maturing and had not fully ripened when frost came on September 8.

The plots were sown on May 2, on clay loam soil, summer-fallowed land, by hoe-drill at the rate of 2½ bushels of seed per acre. There was no rust on any of these plots.

OATS—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Buckbee's Illinois	Sept. 6	128	44	Strong	8	Branching	3,600	79	14	38
Rosedale	" 3	125	47	Medium	8	Sided	4,540	76	26	40¼
Columbus	" 6	128	45	"	9	Branching	3,900	76	16	37¼
Abyssinia	" 6	128	46	"	8	Sided	4,040	75	30	39
Early Maine	" 5	127	42	Strong	8	Branching	3,740	75	10	38
American Beauty	Aug. 27	118	42	Medium	8	"	3,950	75	..	39
Oderbruch	Sept. 12	134	44	"	8	Sided	3,750	75	..	40
Improved American	" 6	128	46	Strong	8	Branching	3,300	72	20	36
Banner	Aug. 27	118	48	"	8½	"	3,900	72	2	38
Early Blossom	Sept. 6	128	44	"	9	Sided	4,640	71	26	38
Bavarian	Aug. 27	118	44	Medium	9	Branching	3,360	71	26	40
California Prolific Black	Sept. 5	127	40	Strong	8	Sided	3,980	71	6	34½
Great White Maine	" 2	124	42	"	9	Branching	2,560	71	6	39
Early Golden Prolific	Aug. 27	118	44	Medium	9	"	2,400	70	20	40½
Early Gothland	Sept. 12	134	44	Strong	8	Sided	3,560	70	10	41½
Siberian O. A. C.	" 12	134	43	Weak	8	Branching	3,630	69	24	38
Lincoln	Aug. 27	118	43	Strong	8	"	4,050	69	4	40
American Triumph	Sept. 5	127	42	Medium	8½	"	3,000	68	18	41
Miller	" 12	134	42	"	8	"	2,910	68	8	39
Golden Tartarian	" 12	134	39	Strong	8	Sided	3,040	67	32	34¼
Abundance	Aug. 27	118	46	"	9	Branching	4,500	67	22	41
Early Archangel	Sept. 6	128	45	"	9½	"	3,800	67	22	37
Wallis	Aug. 27	118	44	Weak	8½	"	3,100	67	22	40½
Poland	" 25	116	42	Strong	8	"	3,610	67	12	42
King	Sept. 12	134	44	Medium	8	"	2,710	67	2	39½
Pense	" 12	134	44	"	9	Sided	2,750	66	26	38¼
Coulommiers	" 6	128	43	"	8	Branching	4,210	66	16	38¼
Wide Awake	Aug. 27	118	44	"	8	"	3,450	66	6	41
Olive	Sept. 12	134	48	Weak	9	Sided	3,860	65	30	38½
Holland	" 3	125	42	Strong	10	"	3,160	65	30	36½
Newmarket	" 6	128	40	Medium	7	Branching	2,270	65	20	42
Holstein Prolific	Aug. 27	118	45	"	8	"	4,370	65	20	40½
Golden Beauty	" 27	118	43	"	8	"	2,870	65	20	42
Prolific Black Tartarian	" 27	118	44	Strong	8	Sided	3,730	63	28	37¼
White Schonen	" 27	118	45	"	8	Branching	3,880	63	28	41¼
Brandon	Sept. 12	134	45	"	9	"	4,510	61	16	38½
Russell	" 12	134	46	Medium	10	"	4,110	61	16	38
White Giant	Aug. 27	118	44	Strong	9	"	2,940	60	20	40½
Flying Scotchman	" 27	118	42	"	8	"	2,650	60	10	40½
Golden Giant	Sept. 12	134	43	"	10	"	3,480	59	14	35½
Medal	" 12	134	48	Medium	9	Sided	3,150	58	28	39½
Mortgage Lifter	Aug. 27	118	44	"	8	Branching	2,750	57	12	42½
Danish Island	Sept. 2	124	40	"	7	"	2,260	57	2	40
Master	" 12	134	43	Strong	8	"	3,460	57	2	38
Imported Irish	Aug. 25	116	44	"	9	"	3,020	56	26	43
Mennonite	" 27	118	38	"	8	"	3,140	56	6	39
Victoria Prize	" 26	117	39	"	10	"	2,620	55	10	44
Joanette	" 26	117	32	"	6	"	2,140	54	24	38
Doncaster Prize	Sept. 6	128	38	"	7	"	3,550	54	14	38
Prize Cluster	Aug. 25	116	43	"	9	"	3,180	53	18	43½
Hazlett's Seizure	" 27	118	42	Medium	9	"	2,450	53	18	43½
Bonanza	" 25	116	39	Strong	8	"	2,210	52	22	43
Rennie's Prize	" 25	116	42	"	8	"	3,020	52	12	44
Welcome	" 25	116	44	"	10	"	2,640	52	2	45
Improved Ligowo	" 25	116	39	"	8	"	1,640	51	26	41
White Russian	" 27	118	42	"	8	"	2,340	51	26	40
White Wonder	" 25	116	42	"	9	"	3,560	51	6	44
Oxford	Sept. 12	134	44	"	9	"	2,260	51	6	39
Winter Grey	Aug. 25	116	40	"	8	"	4,320	49	14	43
Thousand Dollar	" 26	117	40	"	7	"	1,320	49	14	43
Cromwell	Sept. 12	134	42	"	8	"	3,140	48	28	38½
Scottish Chief	Aug. 27	118	44	Weak	9	"	2,220	45	10	37½
Cream Egyptian	" 25	116	44	Strong	10	"	1,770	45	..	43
Dawson	" 27	118	42	Medium	8	"	2,600	44	4	42¼
Finland Black	Sept. 3	125	46	Strong	10	"	2,630	41	6	36
Black Mesdag	Aug. 24	115	38	"	8	"	2,190	29	24	38

TEST OF FORMALIN, BORDEAUX MIXTURE AND BLUESTONE AS PREVENTIVES OF SMUT IN OATS.

Three very smutty samples, each of seed of Doncaster Prize, Flying Scotchman and Mortgage Lifter oats, were treated as follows :—

One sample of each was steeped for four hours in Bordeaux Mixture made with one pound of sulphate of copper and one pound of lime in ten gallons water.

Another sample of each was soaked for two hours in a mixture of 3 oz. Formalin in ten gallons water.

The third of each was soaked for two hours in a mixture of 4½ oz. Formalin in ten gallons of water, and for comparison a sample of each of the three varieties was sown without treatment.

Another test of Bordeaux Mixture and Bluestone was made with clean seed of Banner oats.

All these plots were sown side by side, on the same day, on summer-fallow, by hoe drill at the rate of 2½ bushels per acre.

Variety.	Condition of Seed.	Treatment.	On 25 Sq. Feet.	
			Heads, Good.	Heads, Smutty.
Doncaster Prize	Smutty	Bordeaux Mixture	684	20
"	"	3 oz. Formalin	634	0
"	"	4½ oz. "	674	0
"	"	Untreated	734	34
Flying Scotchman	Smutty	Bordeaux Mixture	703	18
"	"	3 oz. Formalin	723	0
"	"	4½ oz. "	823	0
"	"	Untreated	723	25
Mortgage Lifter	Smutty	Bordeaux Mixture	768	11
"	"	3 oz. Formalin	743	0
"	"	4½ oz. "	783	0
"	"	Untreated	692	22
Banner	Clean seed	Bordeaux Mixture	719	0
"	"	Bluestone	693	1
"	"	Untreated	746	7

From the above table it will be seen that Bordeaux Mixture and Bluestone were effective in the treatment of clean seed; while Formalin proved a complete remedy with seed which was badly affected by smut.

EXPERIMENTS WITH BARLEY.

Frosts in May made the crop of barley smaller than it would otherwise have been. The test-plots and larger field-lots were several times cut back and a considerable number of the young plants never recovered. Pigweed, in the field-lots also helped to decrease the yield.

Late rains gave large and plump grain in all the varieties, but at the same time caused the grain to be much discolored.

The larger lots of barley were sown on fallow, on a field exposed to winds which, though not so severe as in former seasons, were bad enough, in conjunction with spring frosts, to retard growth and cause the crop to mature unevenly and late.

Results of Early, Medium and Late Sowings.

The two varieties used in this test were Odessa, six-rowed, and Canadian Thorpe, two-rowed. The plots were one-tenth acre each, the soil clay loam, sown on summer-

fallow. The seed was sown by hoe-drill, at the rate of two bushels of seed per acre. The first plots were sown on 23rd April, and the sowings were continued on the same day each week after until 28th May.

The six plots of each variety ripened in the order sown and in time to escape the frost on 8th September. All gave satisfactory yields, with the exception of the first two sowings of Canadian Thorpe which were blighted by hot weather in July. It will be noticed that these two plots were ripe and cut on 11th and 13th August, two days earlier than the first two sowings of Odessa, whereas Odessa usually ripens from four to seven days earlier than the Canadian Thorpe. There was no rust on any of these plots.

BARLEY.—RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per acre.	Yield per Acre.		Weight per Bushel.
				In.		In.	Lbs.	Bush.	Lbs.	
Odessa	April 23	Aug. 13	113	30	Strong	3	3,120	55	40	51
"	" 30	" 15	108	30	Medium	3	3,070	56	42	51
"	May 7	" 19	105	34	"	3	3,790	54	18	50½
"	" 14	" 24	103	30	"	2½	5,610	48	36	50¼
"	" 21	" 26	98	33	"	2½	3,910	47	34	51
"	" 28	Sept. 5	101	34	Weak	2½	3,100	47	44	52
Canadian Thorpe	April 23	Aug. 11	111	30	Strong	3	3,170	36	2	51
"	" 30	" 13	106	30	"	3	3,230	36	42	52½
"	May 7	" 19	105	32	"	3	2,850	44	38	53
"	" 14	" 24	103	38	"	3	5,630	56	32	52¼
"	" 21	" 27	99	38	"	3	3,730	57	34	53½
"	" 28	Sept. 6	102	36	Medium	3	5,020	57	44	49

BARLEY—FIELD LOTS.

Thirteen varieties were sown in fields of one-half to five acres each. In addition to the injury sustained by frosts in May, winds, which had a clear sweep over these fields, left more or less of the roots exposed, causing the crop to mature unevenly and late. The sample is plump and large but dark in colour.

The seed was sown on clay loam summer-fallowed, by hoe drill, at the rate of 1¾ bushels per acre. There was no rust on any of these fields.

BARLEY.—FIELD LOTS.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per acre.	Yield per Acre.		Weight per Bushel.
					Inch's		Inches.	Lbs.	Bush.	Lbs.	
Canadian Thorpe	5 acres	May 2	Aug. 19	110	36	Strong	3	4,730	48	18	53
Odessa	5 "	" 3	" 15	105	32	Medium	2½	3,450	46	..	50¾
Sidney	5 "	" 2	" 29	120	34	Strong	3¼	3,800	44	..	54
Trooper	4 "	" 3	" 26	116	32	"	2¼	3,400	36	38	53
Beaver	1½ "	Apl. 30	" 24	117	34	"	3	3,610	34	36	52½
Common	¾ "	May 2	" 20	111	34	Medium	2¼	4,210	47	17	50½
Oderbruch	¾ "	" 2	" 24	115	32	"	2½	3,760	44	36	49
Baxter	1 "	" 2	" 20	111	34	"	2¼	3,980	42	..	50½
French Chevalier	1 "	" 2	" 29	120	32	Strong	3¼	3,750	42	..	54
Mensury	¾ "	" 2	" 20	111	40	Medium	2½	4,200	41	17	46¼
Rennie's Improved	¾ "	" 2	" 24	115	34	Strong	2¼	3,130	40	30	52½
Royal	½ "	" 2	" 19	110	32	"	2¾	3,040	40	..	50
Bolton	¾ "	" 2	" 25	116	34	"	3	3,310	36	..	53

Six-Rowed Barley.—Test of Varieties.

Twenty-three varieties have been included in this test, sown on plots of one-tenth acre each. The soil was clay loam which had been summer-fallowed, and the seed was sown by hoe-drill on the 4th of May, at the rate of two bushels per acre. There was no rust on any of the varieties, but three of them were somewhat injured by smut, namely Common Six-rowed, Stella and Summit.

Six-Rowed Barley.—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per acre.	Yield per Acre.		Weight per Bushel.
			Ins.		In.	Lbs.	Bush.	Lbs.	Lbs.
Rennie's Improved	Aug. 19	108	30	Strong	2½	4,380	56	32	52
Petschora	" 19	108	31	Medium	2½	3,070	54	38	48½
Odessa	" 16	105	27	Strong	2½	3,050	53	6	51
Baxter	" 19	108	33	Medium	2¼	2,890	52	14	50
Trooper	" 27	116	29	Strong	2¼	4,830	51	22	52½
Phœnix	" 19	108	32	"	2½	3,830	50	20	51¼
Common	" 23	112	29	"	2¾	2,850	48	46	50½
Argyle	" 27	116	31	"	2½	2,900	47	44	52
Nugent	" 24	113	28	"	2¼	2,730	47	24	49
Pioneer	" 27	116	36	"	3¼	4,820	47	24	51
Mensury	" 19	108	36	"	3	3,220	47	14	46
Stella	" 26	115	29	"	2¾	3,130	47	14	51
Champion	" 15	104	37	Medium	3½	3,830	46	12	47
Excelsior	" 13	102	36	Weak	3	4,080	46	12	47
Summit	" 26	115	32	Strong	3	3,090	46	2	51
Royal	" 19	108	32	"	3	2,810	45	30	50
Oderbruch	" 19	108	32	"	2½	3,350	44	38	49½
Mansfield	" 27	116	31	"	2½	2,820	43	16	51¼
Blue	" 13	102	30	Medium	2¼	4,010	42	24	45¼
Success	" 8	97	30	Weak	2½	3,920	42	4	47
Surprise	" 26	115	28	Strong	2½	3,650	37	24	49
Empire	" 27	116	32	"	2½	3,300	37	24	53
Vanguard	" 16	105	27	"	2¾	2,840	30	20	49½

Two-Rowed Barley.—Test of Varieties.

Eighteen different sorts of two-rowed barley were tested this year on clay loam summer-fallowed, all were sown on 4th May in plots of one tenth acre each. No rust was found on any one of them, and the following yields were obtained.

Two-rowed Barley—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			Ins.		Ins.	Lbs.	Bush.	Lbs.	Lbs.
Danish Chevalier	Sept. 2	122	30	Weak	3¼	4,070	57	44	54
Thanet	" 5	125	37	"	4	4,090	54	18	47
Prize Prolific	" 5	125	32	"	3½	4,320	53	36	49
Newton	Aug. 31	120	32	Strong	3	4,090	53	16	53
Kinver Chevalier	Sept. 5	125	34	Weak	3½	5,000	53	6	46
French Chevalier	" 2	122	32	"	3½	4,150	53	6	54
Canadian Thorpe	" 6	126	36	Medium	3	4,090	50	10	53¼
Sidney	" 2	122	36	"	3¼	4,250	50	..	54
Kirby	Aug. 27	116	35	Strong	3	2,560	44	28	52
Dunham	Sept. 1	121	38	"	2¾	3,700	43	36	53½
Nepean	" 2	122	32	"	3¼	3,200	41	32	52
Bolton	" 1	121	36	Medium	3¼	4,420	41	12	53
Leslie	Aug. 27	116	37	Strong	3	3,280	40	..	52
Logan	" 27	116	28	"	3¼	3,400	39	28	53
Victor	Sept. 1	121	32	"	3	5,900	37	24	54½
Beaver	" 2	122	32	"	3¼	3,720	37	4	52¼
Monck	" 2	122	36	"	3¼	4,240	36	22	54
Pacer	" 2	122	32	"	3	3,090	35	30	54

TEST OF PREVENTIVES OF SMUT IN BARLEY.

Bordeaux Mixture and a solution of bluestone were used in this test and for comparison a plot was sown with untreated seed. The seed used was ordinary, clean Canadian Thorpe, the product of treated seed sown in 1897.

Variety.	Treatment.	Sown.	On 25 Square Feet.	
			Good Heads.	Smutted Heads.
Canadian Thorpe	Bluestoned	May 6	921	1
"	Bordeaux Mixture	" 6	823	2
"	Untreated	" 6	912	17

The bluestone solution was the one ordinarily used for wheat, one pound of bluestone dissolved in two pails of water for each ten bushels of seed.

Bordeaux Mixture was made in the proportion of 1 pound sulphate of copper, 1 pound lime to 10 gallons water and in this solution the seed was allowed to soak for four hours.

EXPERIMENTS WITH PEASE.

The yield from all the varieties of pease tested was good but the sample was not quite equal to that of former years. Varieties that ripened early were better in this respect than the later sorts.

Heavy rains in July and up to the time of cutting gave the late varieties a most vigorous growth, in consequence of which 13 of them were on the green side when frost occured on September 8th.

On account of rains great difficulty was experienced in harvesting and threshing the various plots. Frosts in May cut back the vines, retarding the growth until rains came in July,

Results of Early Medium and Late Sowings.

The two varieties sown in this test were Golden Vine, a small pea and Mummy a medium sized variety. The soil was clay loam ; seed sown on summerfallow by hoe-drill on the 5th of May, at the rate of 2 bushels of small pease and 3 bushels of medium per acre. The size of the plots was one-tenth acre each. The first plot of Golden Vine and the two first of Mummy were injured by frosts in May.

Pease.—Results of Early, Medium and Late Sowings.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw per Acre.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					In.	Lbs.	In.		Bush.	Lbs.	Lbs
Golden Vine.........	April 23..	Aug. 30..	130	Medium..	36	2,390	2	Small.....	28	30	65¾
"	" 30..	Sept. 1..	125	" ..	36	....	2	"	41	20	66
"	May 7..	" 1..	118	Strong ...	42	2,840	2	"	41	..	65½
"	" 14..	" 3..	113	" ...	48	3,160	2	"	37	20	65½
"	" 21..	" 5..	108	" ..	45	2,310	2	"	39	50	65
"	" 28..	" 10..	106	" ...	48	2,530	2	"	39	30	63
Mummy............	April 23..	" 1..	132	Weak	36	1,690	2½	Medium..	26	50	64½
"	" 30..	" 2..	126	"	36	2,070	2½	" ..	23	..	64
"	May 7..	" 3..	120	Medium..	36	2,200	2½	" ..	35	..	64½
"	" 14..	" 5..	115	" ..	48	2,010	2¼	" ..	31	30	64½
"	" 21..	" 12..	115	Strong ...	48	2,110	2¼	" ..	36	30	65
"	" 28..	" 12..	108	" ...	48	2,440	2¼	" ..	34	20	63

Pease.—Test of Varieties.

The trial plots of pease sown to gain information as to their relative yield and earliness included forty-eight varieties. These were all sown on one-tenth acre plots. The soil was a clay loam which had been summer-fallowed, and the seed was sown on the 5th of May at the rate of two bushels of the small pease and three bushels of large pease per acre.

PEASE.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw per Acre.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.	In.		Bush.	Lbs.	Lbs.
Paragon	Sept. 6	125	Strong	45	4,460	3	Medium	57	50	64
Trilby	" 8	127	"	42	4,940	3	"	55	10	62½
Perth	" 3	122	"	45	3,110	3	Large	49	30	63
Bruce	" 2	121	"	42	3,940	3	"	49	30	65
Golden Vine	" 1	120	Medium	39	3,340	2	Small	49	..	64
Crown	" 3	122	"	39	2,800	2	"	45	30	65
Pride	" 8	127	"	36	2,860	2¼	Large	44	50	65½
Duke	" 5	124	Strong	45	3,130	3	"	44	30	61½
Early Britain	Aug. 29	117	Medium	28	3,000	2¼	"	44	..	63
New Potter	Sept. 5	124	"	36	2,300	3	"	43	20	63
Elephant Blue	" 6	125	"	36	3,210	3	Medium	43	10	64
Creeper	" 12	131	Strong	42	2,770	2	Small	43	..	65
Victoria	" 7	126	"	45	2,520	3	"	41	20	62
White Wonder	Aug. 27	115	Weak	18	2,000	2	Medium	40	20	65
Daniel O'Rourke	Sept. 5	124	Medium	36	3,530	2½	Small	40	20	65
King	" 6	125	Strong	42	2,400	2½	Large	40	10	62¾
Vincent	" 3	122	Medium	45	2,400	3	"	40	..	63¼
Bright	" 6	125	Strong	42	3,000	2½	Medium	40	..	64
Prince Albert	" 10	129	"	48	2,930	2½	Small	39	30	62
Archer	" 8	127	"	42	3,270	3	Medium	38	50	63½
Harrison's Glory	Aug. 29	117	Weak	24	2,540	3	Large	38	30	63
Chancellor	" 27	115	Medium	32	2,990	2	Small	38	30	65¼
Mackay	Sept. 4	123	Strong	45	3,000	3	"	38	20	63
Kent	" 5	124	"	42	3,010	3	Large	38	10	63
German White	Aug. 29	117	"	32	2,400	2½	Medium	37	40	64¾
Oddfellow	Sept. 6	125	"	42	3,300	3	"	37	30	67¼
Picton	" 12	131	"	36	5,400	2½	"	36	40	63¼
Centennial	" 10	129	"	48	2,520	2½	"	36	20	61
French Canner	Aug. 29	117	Medium	32	2,200	2¼	"	36	..	64¼
Cooper	Sept. 12	131	"	36	1,600	2½	Large	35	40	65
Nelson	" 1	120	Strong	42	2,420	3	Medium	35	30	64½
Prussian Blue	" 6	125	"	42	2,720	2	"	35	20	63½
White Marrowfat	" 10	129	"	48	2,650	3	Large	35	..	61
Carleton	" 7	126	"	48	5,150	3	Medium	34	10	62
Black Eyed Marrowfat	" 12	131	Medium	42	4,260	3	Large	33	10	62
Alma	" 5	124	"	42	2,000	2½	Small	32	40	63
Gregory	" 1	120	Strong	45	2,660	3	Medium	32	40	63
Agnes	" 4	123	Medium	36	2,070	2	Large	32	10	64
Bedford	" 7	126	Strong	54	6,600	2	Medium	31	40	62¼
Lanark	" 4	123	"	45	3,100	3	Large	31	40	63
Mummy	" 5	124	Medium	36	3,150	3	Medium	30	50	63¼
Canadian Beauty	" 6	125	"	39	2,460	2	Large	30	40	61
Fergus	" 8	127	Strong	48	2,700	2	Small	30	..	62
Multiplier	" 10	129	"	51	2,720	3	"	29	40	62¼
Fenton	" 1	120	"	39	1,720	3	Large	29	40	61½
Prince	" 4	123	"	42	4,100	3	"	29	10	63
Arthur	" 1	120	Medium	36	1,370	3	Medium	28	50	64¼
Macoun	" 9	128	Strong	51	6,000	3	Large	28	20	62½

EXPERIMENTS WITH INDIAN CORN.

Twenty-five varieties of Indian corn were grown the past year in uniform test plots. The seed was sown by grain drill in rows three feet apart and planted by hand in hills three feet apart each way. The land was a clay loam, fallowed the year previous and manured, in the fall, with 15 loads well rotted barn-yard manure per acre. The work on fallow consisted of one deep ploughing early in June and three surface cultivations with spring-tooth cultivator during the growing season. Early in October the manure was applied and the land again ploughed to a depth of 7 to 8 inches, then harrowed well

and rolled. Before sowing the seed two inches of the surface was stirred by cultivator and harrowed. The corn was sown and planted on May 16th and the plants were two to four inches high when cut back by frost on the 27th of same month. Where the corn was just above ground when cut down the recovery was much more rapid than where the plants had attained a height of several inches.

The difference in results between sowing in rows and planting in hills was not so marked as in former years.

On the whole, the crop was larger than last year but was not so far advanced when it had to be cut for fear of frost. Only one variety had reached the early milk stage when the crop was cut.

All plots were cut on September 7th and 8th and allowed to remain on the ground for two days to wilt before being drawn into the barn when it was cut by ensilage-cutter and put in the silo.

One hundred tons were put in silo, and at present time the ensilage is being mixed with cut straw and fed to stock. The yield per acre, in each case, has been calculated from the weight obtained from two rows each 66 feet long.

INDIAN CORN.—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	Height.	When Tasselled.	In Silk.	Condition when Cut.	Weight per Acre, Grown in Rows.		Weight per Acre, Grown in Hills.	
		Inches.			Sept. 7.	Tons.	Lbs.	Tons.	Lbs.
Thoroughbred White Flint	Medium	72	Aug. 25		Tassel	18	620	14	1,568
Champion White Pearl	Strong	81	" 24		"	16	1,264	14	1,700
Giant Prolific Ensilage	"	78	" 24		"	15	492	17	452
Red Cob Ensilage	Medium	72	" 24		"	14	1,964	13	1,720
Compton's Early	"	72	" 23		"	14	1,568	12	740
Sanford	"	72	" 23		"	13	1,720	17	980
Selected Leaming	"	72	" 24		"	13	796	9	1,930
White Cap Yellow Dent	Strong	78	" 25		"	12	1,740	14	1,172
Canada White Flint	Weak	66	" 20	Sept. 1	Silk	12	816	14	1,040
Early Butler	"	66	" 23	" 1	"	12	552	9	1,930
Cloud's Early Yellow	"	66	" 20		Tassel	12	420	10	1,120
Angel of Midnight	Medium	72	" 20	Sept. 1	Silk	11	1,232	13	1,852
Mammoth 8-Rowed Flint	"	72	" 26		Tassel	11	968	12	740
Extra Early Huron Dent	Strong	78	" 23		"	11	572	8	760
King of the Earliest	Weak	60	" 26		"	10	1,780	8	500
Longfellow	Medium	72	" 21	Sept. 1	Silk	10	1,384	14	1,040
Pearce's Prolific	Weak	66	" 23	" 1	"	9	1,800	12	550
Mitchell's Extra Early	"	48	" 8	Aug. 16	Early milk	9	876	8	1,820
Pride of the North	Strong	78	" 26		Tassel	9	742	9	612
Cuban Giant	Weak	60	" 25		"	9	216	7	1,312
Early Mastodon	"	60	" 20		"	8	764	10	1,912
Ruby Mexican	"	48	" 25		"	8	632	9	1,140
North Dakota White	"	54	" 23		"	8	236	10	460
Kendall's Giant	"	42	" 25		"	8	236	4	52
Evergreen Sugar	"	48	" 28		"	6	540	8	630

TEST OF SOWING AND PLANTING CORN AT DIFFERENT DISTANCES APART.

This test was made on land worked and manured the same as for uniform test of varieties. Three varieties of corn were sown in rows and planted in hills at different distances apart, and from the accompanying table it will be seen that in hills the closer the planting the better the crop, while in rows the reverse was the case.

TEST OF SOWING AND PLANTING CORN.

Variety.	Distance Sown or Planted.	Growth.	Condition when Cut.	Height.	Weight per Acre.			
					Rows.		Hills.	
	Feet.			Inches.	Tons.	Lbs.	Tons.	Lbs.
Selected Leaming	4	Strong....	Tassel....	72	18	1,620	9	744
"	3½	"	"	72	18	564	12	156
"	3	"	"	72	15	1,680	13	1,324
"	2½	"	"	80	14	1,964	13	664
"	2	"	"	80	13	1,984	14	248
Longfellow	4	"	"	60	16	1,792	11	1,232
"	3½	"	"	60	16	1,792	12	816
"	3	"	"	60	16	1,924	12	1,608
"	2½	"	"	72	14	1,172	12	948
"	2	"	"	72	16	340	13	1,720
Champion White Pearl	4	"	"	72	21	164	14	1,040
"	3½	"	"	72	16	1,528	17	320
"	3	"	"	72	21	108	19	1,336
"	2½	"	"	66	22	1,540	16	1,528
"	2	"	"	66	9	1,140	15	1,680

EXPERIMENTS WITH FLAX.

The experiments with flax were not very satisfactory, the early sown plots being badly injured by frosts in May.

The tests were made on fallow land, clay loam, not manured, and the size of the plots was one-tenth acre each.

Seed Sown at Rate of	Date of Seeding.	Date of Cutting.	Days to Mature.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.	
				Inches.	Lbs.	Bush.	Lbs.
40 lbs. per acre	May 14..	Sept. 7..	117	24	450	8	..
80 "	" 14..	" 7..	117	24	670	13	30
40 "	" 21..	" 7..	110	24	1,340	11	10
80 "	" 21..	" 7..	110	26	1,450	16	..
40 "	" 28..	" 7..	103	26	1,350	15	..
80 "	" 28..	" 7..	103	24	1,650	22	..
An extra plot sown 60 lbs. per acre	" 19..	" 6..	111	24	1,690	19	10
Field lot (1 acre)	" 19..	" 6..	111	24	1,260	16	20

EXPERIMENTS WITH GRASSES.

Following are the yields per acre of grasses sown in the spring of 1896 :—

Agropyrum tenerum	2 tons 250 pounds.
" caninum	1 " 860 "
Meadow Fescue	1 " 360 "
Timothy and Alsike Clover	1 " 370 "

AGROPYRUM TENERUM.

On account of this grass having produced good crops in trial plots for the past two years, a field of three acres was seeded down to it early in July. A good catch was obtained and the grass made good progress before winter set in. The seed, like Brome seed, germinates easily, and if not sown too thick will in ordinary seasons produce satisfactory crops of hay for horses. It should, however, be cut before the stem hardens and becomes woody. Cattle do not seem to relish it much, and for fall pasture it is useless.

AWNLESS BROME GRASS (*Bromus Inermis*).

The crop of hay obtained from the fields of Brome grass was the lightest that has been cut on the farm since the introduction of this grass. With the exception of 1¼ acres of first crop, the greater part of the land under Brome grass had produced a crop of seed last year, and the balance had been cut for hay and seed for three and four years. Eight acres of the latter produced only 1,000 pounds cured hay per acre, fields from which one crop had been taken 1,700 pounds per acre, and the 1¼ acres sown last year 2 tons 500 pounds per acre.

The light crop was, no doubt, caused by the dry condition of the land in the fall of 1897 and insufficient rainfall, in April or May of this year, to give the grass a start.

The crop of Brome grass throughout the country was much the same as on the experimental farm. Where the grass was being cut for the first time either for hay or seed, a fair, and in some cases a good crop was secured, whereas fields producing the second, third or fourth crop were very light.

Mr. F. W. Godsal, in the Pincher Creek district, of Alberta, obtained nearly 8,000 pounds of seed. Mr. W. R. Motherwell of Abernethy, Assiniboia, a successful grower of this grass, had between 500 and 600 pounds of seed per acre. To produce these quantities of seed, the crops of hay must necessarily have been very heavy.

For information regarding the seeding of Brome grass the following is quoted from the report for 1896 :

"This grass is better sown alone ; at least it should not be sown with a grain crop. The grain takes too much moisture from the young grass-plants, only the most vigorous of which will survive the dry weather in September; whereas, if sown alone all the plants have an equal chance.

" It is also advisable to sow the seed on soil that does not blow. Summer-fallow would be the best preparation, but on account of its liability to drift it is not safe in many parts of the Territories to use this kind of land. Stubble land ploughed three or four inches deep in April or May, and well harrowed after the seed is sown, is found to be quite safe from winds as the stubble harrowed on top prevents all drifting."

Ten to twelve pounds of seed is required per acre. " More seed will give a better crop the first year, but less afterwards as the roots thicken up each year and in three or four years makes better pasture than hay.

"The seed being light, long and thin, seeding by hand is the only practicable method. To seed properly a calm day should be chosen, so that all parts of the land may be evenly sown.

"While the plants are young, weeds are sure to make great headway and it is necessary to keep them, at least from going to seed. The quickest way to accomplish this is to go over the field with a mower, cutting just above the grass-plants. If this operation has to be repeated it will be necessary to cut the tops of the grass, but this will not injure the plants, in fact it is an advantage in the way of giving the roots a better hold.

" The first crop of hay can be cut the next year after seeding, and will, in ordinary years be ready early in July. Eight or ten days after being ready to cut for hay it will be fit to cut for seed if so desired.

" On this farm it has always been cut in first blossom for hay and ten days from this time it is considered in proper state to cut for seed.

"In cutting for seed a binder is used and the grass is cut, tied and stooked the same as wheat or other grain. In a week or ten days after cutting it is ready to thresh or store away as deemed best.

"For threshing small quantities the old-fashioned flail is suitable, but for large lots a threshing machine should be used on which the wind has been closed off as much as practicable. From three to six hundred pounds of seed may be expected from an acre."

RENEWAL AND ERADICATION OF BROME-GRASS.

Last fall, just before winter set in, one half acre of Brome sod was ploughed four inches deep in as narrow furrows as possible. Four crops of hay had been cut from the plot and the roots had become very thick.

On the 6th May, 1898, Prince Albert pease were sown, harrowed in and rolled. Shortly after the pease were sown the grass commenced to grow very thick, and from that time it was a race between Brome grass and pease, with the result that pease were one-third crop and Brome grass a good catch. The pease and grass were cut by mower and the land left to see what results can be obtained in renewing Brome sod without reseeding. Three-quarters of a ton of pease and Brome hay was cut from the one-half acre.

On 14th, 15th, 16th and 19th April last, 7 acres of Brome sod was ploughed two inches deep. By the time the sod was rotted sufficiently to backset, quite a heavy growth of grass was covering the land. On 16th, 17th, 18th and 20th June, all but one-half acre of this land was backset 4 inches deep. Brome roots continued to grow after the backsetting, and the land was again ploughed before winter set in. The one-half acre not backset had, when the remainder of the plot was ploughed the second time, a good catch of grass which promises a crop of hay next year.

Last spring, after seeding was finished, an old piece of Brome sod was gone over four times with iron harrows to determine whether or not it could be renewed without ploughing. The result clearly demonstrated the impracticability of this method.

As stated in the report of last year, several acres of Brome sod was ploughed on 18th, 19th and 20th May, 1897, and sown to pease at the time or backset later on. That portion sown with pease was ploughed last fall and together with part of the backsetting was sown with Red Fife wheat this spring. The balance of the backsetting was used for potatoes, corn, pease and roots. The wheat averaged 20 bushels per acre and the potatoes, pease, corn and roots yielded one-third less than the same varieties sown on fallowed and manured land.

EXPERIMENTS WITH CLOVERS, ETC., FOR GREEN MANURING.

Recognizing the necessity of making some preparations for manuring the land in the future, when exhaustion of the soil will have taken place through continual cropping, a series of tests was commenced last spring, with a view of finding some plant suitable for soiling purposes.

The land chosen for the test was a five-acre field of clay loam over which winds have a great sweep, and in the past ten years have blown several inches of the top-soil to adjoining farms. The field produced a crop of barley in 1897, and before sowing, this spring, the plots were ploughed six inches deep and well harrowed.

On the 12th May, nine one-half acre plots were sown one each with Red Clover, Alsike Clover, Pease, Tares, Bromus Inermis, Mammoth Clover, Lucerne, Rape and Buckwheat; the remaining one-half acre being left unsown and fallowed later in the season. The seeds in all the plots germinated soon after being sown and made good growth during the months of June, July and August. Weeds were numerous and the mower had to be run over the clover and grass plots several times to keep them in check. This, however, was done without cutting any of the grass or clover plants.

When the pease, tares, rape and buckwheat had attained their maximum growth they were ploughed under and the plots harrowed; later on, when the clovers and grasses had ceased growing they were treated in the same way.

The half-acre plot not seeded was summer-fallowed by one deep ploughing and several surface cultivations during the growing season.

Next spring it is intended to sow the entire field with Red Fife wheat, when some information regarding the value of the various plants for green manuring will be gained by the yield of the plots, which will be cut and threshed separately.

TEST OF CLOVER TREATED WITH NITRAGIN.

Two uniform plots of one-tenth acre each were chosen. The land was a clay loam in one of the garden inclosures which had been prepared for corn and roots.

Clover seed treated with nitragin and similar seed untreated was received from Ottawa early in the season with instructions for carrying on this test. The seed was sown at the rate of 10 lbs. per acre—on one of the plots the seed which had been impregnated with nitragin germs, and on the other the untreated seed. These were both sown 16th June, when the soil was moist and warm, and the seed germinated quickly. By 1st July the "treated seed" plants were 2½ inches high, while the "untreated" were not over 1½ inches. Both plots grew fast and headed out on 1st October. The "treated" plot was much more matted and grew 12 to 15 inches high, whereas the "untreated" did not exceed 12 inches in height.

EXPERIMENT WITH SPRING RYE.

Spring rye was sown on two acres of fallowed land on April 19th, and cut on August 13th. The straw was 40 inches high; its weight was 3,000 lbs. per acre; and the yield of grain was 29 bushels per acre.

EXPERIMENT WITH BUCKWHEAT.

One-tenth of one acre was sown on June 2nd; which produced a heavy crop of straw, but the heads were blighted and did not fill.

EXPERIMENT WITH RAPE.

This was sown May 20th, on a one-tenth acre plot at the rate of 2 lbs of seed per acre, on fallow land manured. Later it was cut and fed to stock. The yield was 16 tons 600 lbs. of green fodder per acre.

EXPERIMENT WITH TARES.

These were sown on fallow on May 19th; and cut on August 31st. Height 55 in.; weight of straw, (dry) 2,740 lbs; seed, 11·40 bushels per acre.

CANARY-GRASS.

This was sown May 19th, on a one-tenth acre plot and cut September 6th. Height 30 inches, yield of hay, 2,900 lbs per acre; seed, 18½ measured bushels per acre.

EXPERIMENTS WITH JAPANESE MILLET, EARLY SOJA BEANS AND HORSE BEANS.

JAPANESE MILLET.

The seed of this millet, also the seed used in the two following tests of Soja Beans and Horse Beans was received early in the season from the Director with instructions for sowing. The chief object in view in these experiments was to gain information as to the relative usefulness of these plants and horse beans as forage crops in this climate, and the weight of crop obtainable from each when sown in different ways.

Three plots of Japanese millet were sown on May 28. In the first the drills were 9 inches apart; in the second 12 inches apart and in the third the seed was sown broadcast. The plots were cut on September 7 and the millet fed to stock. About half of each variety had headed out at this date and the straw was from 39 to 42 inches high. The following yields were obtained :

	Per acre Tons.	Lbs.
1st Plot. Drills 9 inches apart yielded	16	800
2nd Plot. Drills 12 inches apart yielded	14	
3rd Plot. Broadcast	14	800

EARLY SOJA BEANS.

Three plots were first sown May 15 and cut by frost May 27. They were sown again on May 28th. The first plot was sown in drills 2 feet apart, the second $2\frac{1}{2}$ feet apart and in the third the drills were 3 feet apart. All the plots made a fair growth and were just forming pods when destroyed by frost on September 8th.

The frosted beans were weighed after cutting with the following results :

	Lbs. Per acre.
Drills 2 ft. apart yield	1,650
Drills $2\frac{1}{2}$ ft. apart yield	1,325
Drills 3 ft. apart yield	1,275

The weights of these frosted vines gives scarcely a fair idea of what the weights would have been had frost come later.

HORSE BEANS.

These were sown on three plots on May 28, in drills 2 feet, $2\frac{1}{2}$ feet and 3 feet apart, the same as the Soja Beans. The crops were cut September 7th and put into the silo with corn.

The yields from the plots were as follows :—

	Per acre. Tons.	Lbs.
Drills 2 feet apart	3	600
Drills $2\frac{1}{2}$ feet apart	2	1,600
Drills 3 feet apart	2	1,200

POTATOES.

One hundred varieties were tested on land summer-fallowed in 1897. The work on this land consisted of one ploughing 7 inches deep, in the latter part of May, and three surface cultivations 2 to 3 inches deep with spring-toothed harrow during the growing season. From 4th to 8th September, 15 loads (per acre) of well rotted manure was put on, and the land again ploughed 7 to 8 inches deep, well harrowed and rolled.

On May 13 drills were made 4 inches deep and 30 inches apart by plough. In these the cut potatoes were planted 14 inches apart. The pieces had 2 to 3 eyes each, and were from good sized potatoes. The drills were filled in by plough as soon as possible after planting, and the plot was harrowed to level the ground. The land was harrowed when potatoes were appearing, and again a week afterwards. After this the scruffler was run through the rows once a week until the plants became too large to permit of cultivation. The soil was a clay loam. The potatoes were planted on the 13th of May, and dug the 11th of October. The yield per acre has been calculated from the weight of tubers dug from two rows, each 66 feet long; there was no rot in any of the varieties.

Potatoes.—Test of Varieties.

Name of Variety.	Character of Growth.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Polaris	Strong	706	12	690	48	15	24	Oval white.
Early Sunrise	Medium	677	36	657	48	19	48	Long red.
Bovee	Strong	673	12	653	24	19	48	Long pink.
New Variety No. 1	"	660	..	649	..	11	..	Round white.
Late Puritan	"	655	36	644	36	11	..	Long white.
Everett	Medium	651	..	635	48	15	24	Long red.
American Giant	Strong	646	4	631	24	15	24	Oval white.
Daisy	"	633	36	578	36	55	..	Oval pink and white.
Brownell's Winner	"	631	24	591	48	39	36	Flat long red.
Clarke's No. 1	Medium	631	24	594	..	37	24	Oval pink.
Reeve's Rose	"	629	36	601	12	28	36	Long red.
Empire State	Strong	622	36	600	36	22	..	Long white.
Lizzie's Pride	"	622	36	585	12	37	24	"
Beauty of Hebron	Medium	618	12	567	36	50	36	Oval pink.
Charles Downing	Strong	618	12	591	48	26	24	Flat white.
Early White Prize	"	618	12	589	36	28	36	Oval white.
Houlton Rose	Medium	613	48	596	12	17	36	Oval red.
Rochester Rose	"	611	36	569	48	41	48	"
American Wonder	Strong	611	36	591	48	19	48	Oval white.
Northern Spy	"	605	..	596	12	8	48	Flat oval red.
Wonder of the World	"	605	..	561	..	44	..	Long red.
Great Divide	"	594	..	576	24	17	36	Oval white.
Vick's Extra Early	Medium	594	..	578	36	15	24	Oval pink and white.
Burnaby Seedling	Strong	591	48	585	12	6	36	Oval pink.
Carman No. 3	Medium	591	48	572	..	19	48	Long flat white.
Carman No. 1	"	589	36	578	36	11	..	Oval white.
Prize-taker	Strong	589	36	567	36	22	..	Round red.
Early Ohio	Medium	587	24	572	..	15	24	Oval red.
King of the Roses	Strong	580	48	561	..	19	48	"
Irish Daisy	"	580	48	543	24	37	24	Oval white.
Monroe Co	"	574	12	550	..	24	12	"
Early Puritan	"	565	24	554	24	11	..	"
Harbinger	"	565	24	492	48	72	36	Oval pink.
Uncle Sam	"	563	12	543	24	19	48	Oval white.
Green Mountain	"	561	..	547	48	13	12	"
Reading Giant	"	558	48	519	12	39	36	Round red.
Lightning Express	"	558	48	539	..	19	48	Oval red.
New Queen	"	558	48	536	48	22	..	Oval pink.
Victor Rose	Medium	556	36	539	..	17	36	Oval red.
Seedling No. 230	Strong	554	24	545	36	8	48	Round white.
World's Fair	"	554	24	528	..	26	14	Oval white.
McKenzie	"	554	24	539	..	15	24	Long white.
Dakota Red	"	552	12	514	48	37	24	Round red.
Queen of the Valley	"	547	48	547	48	..	..	Flat pink.
Freeman	"	545	36	517	..	28	36	Oval white.
Clay Rose	Medium	541	12	532	24	8	48	Oval pink.
State of Maine	Strong	539	..	530	12	8	48	Oval white.
Sharpe's Seedling	"	536	48	510	24	26	24	Oval pink and white.
Pride of the Market	"	528	..	517	..	11	..	Long white.
Quaker City	"	528	..	501	36	26	24	"
Delaware	"	525	48	517	..	8	48	Oval red.
Peerless Junior	"	523	36	512	36	11	..	Oval white.
Stourbridge Glory	"	517	..	510	24	6	36	Long pink.
Irish Cobbler	"	517	..	486	12	30	48	Round white.
Seattle	Medium	517	..	488	24	28	36	Long white.
Pride of the Table	Strong	517	..	497	12	19	48	Oval pink and white.
Seedling No. 214	"	514	48	479	36	35	12	Round "
Dreer's Standard	"	514	48	506	..	8	48	Oval white.
General Gordon	"	512	36	506	..	6	36	" pink and white.
I. X. L.	"	512	36	486	12	26	24	Long pink.
Honeoye Rose	Medium	512	36	479	36	33	..	Oval pink.
Lee's Favourite	"	508	12	481	48	26	24	" pink and white.
Seedling No. 7	Strong	506	..	492	48	13	12	Round red.
Columbus	"	503	48	486	12	17	36	Oval pink and white.
Troy Seedling	"	499	24	468	36	30	48	Round white.

POTATOES.—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Character of Growth.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Good News	Strong	499	24	481	48	17	36	Long red.
Vanier	Medium	497	12	486	12	11	..	"
Russell Seedling	Strong	497	12	470	48	26	24	Round white.
London	"	497	12	457	36	39	36	Oval red.
Early Rose	Medium	495	..	457	36	37	24	"
Rose No. 9	"	492	48	475	12	17	36	"
Early Harvest	Weak	490	36	457	36	33	..	Oval white.
Algoma No. 1	Strong	488	24	475	12	13	12	" pink.
White Beauty	"	488	24	462	..	26	24	" white.
Crown Jewel	"	486	12	473	..	13	12	Long pink.
Holborn Abundance	"	479	36	473	..	6	36	Oval pink.
Satisfaction	"	477	24	453	12	24	12	Long white.
Cambridge Russet	"	473	..	444	24	28	36	Oval white.
Early Norther	Medium	470	48	457	36	13	12	Round red.
Money Maker	Strong	468	36	462	..	6	36	Oval pink.
Maule's Thoroughbred	Weak	468	36	442	12	26	24	" red.
Bill Nye	Strong	466	24	455	24	11	..	" white.
Earliest of All	Medium	466	24	451	..	15	24	" pink.
Hale's Champion	Strong	466	24	433	24	33	..	Round white.
Early Gem	"	466	24	451	..	15	24	Oval pink and white.
Maggie Murphy	"	453	12	437	48	15	24	" red.
Flemish Beauty	"	442	12	415	48	26	24	" pink.
Rural Blush	"	433	24	415	48	17	36	Short flat red.
Table King	"	415	48	398	12	17	36	Oval white.
Hopeful	"	398	12	380	36	17	36	"
Burpee's Extra Early	Medium	398	12	365	..	33	12	Oval pink and white.
Rural No. 2	Strong	396	.	385	..	11	..	Round white.
Sir Walter Raleigh	Medium	396	..	382	48	13	12	Flat white.
Thorburn	Strong	389	24	376	12	13	12	Oval pink and white.
Ohio Junior	"	385	..	367	24	17	36	" "
Ideal	"	382	48	374	..	8	48	" " "
Fillbasket	Medium	354	12	347	36	6	36	" red.
Orphans	"	354	12	345	24	8	48	" white.
Early Six Weeks	Weak	325	36	275	..	50	36	Round red.
Record	"	259	36	220	..	39	36	Oval white.

EXPERIMENTS WITH ROOTS.

TURNIPS.

Nineteen varieties of turnips were tested. Each variety was sown twice: the first sowing was on May 14, and the second on May 25.

The land for roots was clay loam which had been prepared in the same manner as that for the potatoes, and with the exception of stirring two inches of the surface no work was done on the field in the spring before seeding.

A grain seed drill was used to mark the rows, all teeth being removed except three, which made marks thirty inches apart, in which the seed was sown by a Planet Jr. seed drill at the rate of 2 pounds of seed per acre.

As will be seen, all the varieties gave a satisfactory yield, and with the exception of three, the early seeding gave the best returns. On account of the heavy rainfall, the tops on all the varieties were very rank. The yield per acre was calculated from the weight of roots obtained from two rows, each 66 feet long.

TURNIPS.—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Hall's Westbury	May 14	May 25	Oct. 11	Oct. 11	28	892	948	12	22	880	748	..
East Lothian	" 14	" 25	" 11	" 11	27	384	906	24	21	768	712	48
Giant King	" 14	" 25	" 11	" 11	27	120	902	.	19	808	646	48
Selected Champion	" 14	" 25	" 11	" 11	26	800	880	..	19	1,468	657	48
Drummond Purple-Top	" 14	" 25	" 11	" 11	26	272	871	12	19	1,600	660	..
Hartley's Bronze	" 14	" 25	" 11	" 11	25	1,480	858	..	21	768	712	48
Halewood's Bronze Top	" 14	" 25	" 11	" 11	25	688	844	48	22	1,012	750	12
Shamrock Purple Top	" 14	" 25	" 11	" 11	25	424	840	24	21	1,824	730	24
Sutton's Champion	" 14	" 25	" 11	" 11	24	1,764	829	24	22	616	743	36
Mammoth Clyde	" 14	" 25	" 11	" 11	24	840	814	..	24	1,500	825	..
Skirving's	" 14	" 25	" 11	" 11	22	1,540	759	..	22	880	748	..
Prize Purple-Top	" 14	" 25	" 11	" 11	21	1,956	732	36	15	756	512	36
Perfection Swede	" 14	" 25	" 11	" 11	21	1,032	717	12	17	848	580	48
Purple-Top Swede	" 14	" 25	" 11	" 11	21	636	710	36	19	1,864	664	24
Jumbo or Monarch	" 14	" 25	" 11	" 11	20	788	679	48	23	728	778	48
Carter's Elephant	" 14	" 25	" 11	" 11	20	524	675	24	16	736	545	36
Marquis of Lorne	" 14	" 25	" 11	" 11	20	128	668	48	21	108	701	48
Pearce's Prize Winner	" 14	" 25	" 11	" 11	19	1,996	666	36	18	1,356	622	36
Bangholm Selected	" 14	" 25	" 11	" 11	19	940	649	..	21	1,560	726	..

EXPERIMENTS WITH MANGELS.

Eighteen varieties were tested and two sowings were made of each. The soil was clay loam and the preparation of the land was the same as that for the turnips, and the seed was sown in the same way at the rate of four pounds per acre.

The first seeding was well up when frost occurred on 27th May, causing considerable injury to the plants.

Like the turnips, the mangels produced a strong growth of tops and gave satisfactory returns of roots. The yield per acre was estimated from the weight of crop obtained from two rows, each 66 feet long.

MANGELS.—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Canadian Giant	30	1,908	1,031	48	25	988	849	48
Gatepost	29	1,476	974	36	27	120	902	
Yellow Intermediate	29	212	970	12	22	1,672	761	12
Giant Yellow Globe	28	1,552	959	12	28	64	934	24
Giant Yellow Intermediate (Pearce)	27	1,364	922	44	22	880	748	
Champion Yellow Globe	25	688	844	48	24	492	808	12
Giant Yellow Intermediate (Steele)	24	1,896	831	36	26	4	866	44
Norbitan Giant	24	1,764	829	24	26	1,064	884	24
Mammoth Long Red	24	1,500	825		22	768	746	8
Gatepost Yellow	24	180	803		27	1,704	928	24
New Giant Yellow Half-long	23	1,916	798	36	26	8	866	48
Red Fleshed Tankard	23	1,784	796	24	25	448	840	48
Golden Fleshed Tankard	23	1,520	792		25	1,648	860	48
Ward's Long Oval-shaped	23	1,184	786	24	22	88	734	48
Orange Globe	23	596	776	36	24	1,688	828	8
Selected Mammoth Long Red	22	1,504	758	24	25	28	833	48
Red Fleshed Globe	21	1,560	726		21	88	734	48
Prize Mammoth Long Red	21	1,248	720	48	23	68	767	48

EXPERIMENTS WITH CARROTS.

Sixteen varieties were tested in one seeding on uniform plots. The soil was clay loam, prepared the same as for other roots.

While the returns were not large the crop was the best ever grown on the farm. The yield per acre was estimated, as in the case of the other roots, from the weight of crop gathered from two rows, each 66 feet long.

Carrots—Test of Varieties.

Name of Variety.	1st Plot Sown.	1st Plot Pulled.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.	
			Tons.	Lbs.	Bush.	Lbs.
Half-long White	May 13..	Oct. 13..	9	1,404	323	24
Green-top White Orthe	" 13..	" 13..	9	1,272	321	12
Half-long Chantenay	" 13..	" 13..	9	600	310	..
Ontario Champion	" 13..	" 13..	9	480	308	..
Improved Short White	" 13..	" 13..	9	216	303	36
Mammoth White Intermediate	" 13..	" 13..	8	1,683	294	48
White Belgian	" 13..	" 13..	8	236	270	36
Early Gem	" 13..	" 13..	7	1,840	264	..
Yellow Intermediate	" 13..	" 13..	7	1,180	258	..
Iverson's Champion	" 13..	" 13..	7	520	242	..
Guerande or Oxheart	" 13..	" 13..	7	520	242	..
Giant White Vosges	" 13..	" 13..	7	256	237	36
Carter's Orange Giant	" 13..	" 13..	6	1,200	220	..
Scarlet Intermediate	" 13..	" 13..	6	276	204	36
Long Scarlet Altringham	" 13..	" 13..	4	1,504	188	24
Long Orange or Surrey	" 13..	" 13..	4	976	149	36

EXPERIMENTS WITH SUGAR BEETS.

Six varieties were sown twice on clay loam prepared as for the other root crops, and the seed was sown at the rate of four pounds per acre.

Danish Improved and Danish Red Top were clean and well shaped roots, the others were rough and rooty.

As will be seen, the late seeding in this instance gave much the best returns.

Sugar Beets.—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. 1st Plot.		1st Plot.		2nd Plot.		2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Danish Red Top	May 14	May 25	Oct. 12	Oct. 12	23	332	772	12	24	312	805	12
Danish Improved	" 14	" 25	" 12	" 12	21	372	706	12	23	1,124	785	24
Wanzleben	" 14	" 25	" 12	" 12	17	56	567	36	15	1,944	532	24
Improved Imperial	" 14	" 25	" 12	" 12	16	736	545	36	16	340	539	..
Red Top Sugar	" 14	" 25	" 12	" 12	16	472	541	12	18	828	613	48
Vilmorin's Improved	" 14	" 25	" 12	" 12	11	836	380	36	14	1,568	492	48

VEGETABLE GARDEN.

Frosts in the latter part of May did considerable damage to all early vegetables, but the abundant rainfall in June and July ensured a large crop of everything. Cabbage, cauliflowers, onions, celery, lettuce, beets and radishes far surpassed the production of any previous season. Tomatoes were also a good crop but did not mature as early as usual.

ASPARAGUS.

Three varieties, Conover's Colossal, Barr's Mammoth and Donald's Elmira were grown in beds planted in 1891 and 1893. The crop was somewhat below the average on account of dry weather early in the season, but some good cuttings were obtained from all the varieties. First cut 2nd May, continued in use till 25th June.

BEANS.

Eleven varieties were tested.
Sown 6th May and well up 27th May, frozen 27th May. Resown 29th May.

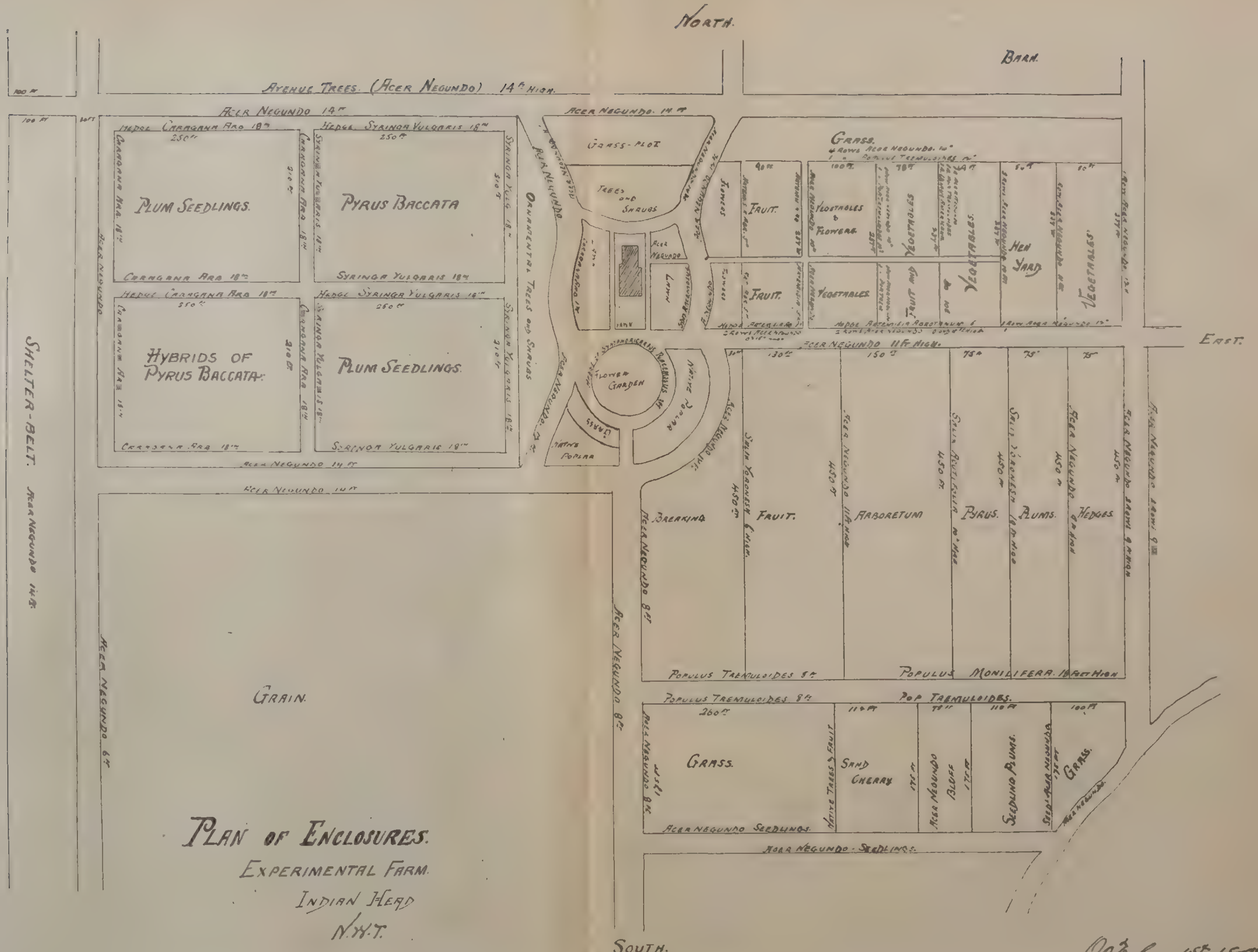
Dwarf White Butter,	in use	August 2.	
Improved Rust-proof,	"	" 4.	
Golden-wax (Simmers),	"	" 3.	
Valentine Wax,	"	July 30.	Good.
Golden Wax (Steele),	"	August 4.	
Wardwell's Kidney Wax,	"	" 6.	The best.
Taber's I.X.L. Green pod.	"	" 4.	
Roger's Lima Wax,	"	July 30.	Good.
Golden Wax (Ferry),	"	August 6.	
Challenge Dwarf Black Wax,		" 8.	
English Broad Windsor,		"	Did not pod.

To save the first seeding from frost, earth was heaped over the vines. Where the covering was less than one inch thick the vines were destroyed: otherwise the plants came through alive but took a long time to recover.

BEETS.

Twelve varieties were sown on May 6th, in drills 18 inches apart. The crop was a large one, but some of the varieties grew thick-skinned and coarse. Lifted Sept. 28th.

Variety.	Fit for Use.	Bush. per Acre.	Remarks.
Detroit Dark Red	July 12..	1,620	Good.
Bonsecours Market	" 15..	1,458	Small, good.
Fine Long Dark	" 15..	1,350	
Brigg's New Extra Early	" 1..	1,026	Good.
Improved Arlington	" 12..	1,026	
Eclipse Early Turnip	" 1..	972	Good.
Long Red	" 20..	972	
Edmand's Blood Turnip	" 12..	864	
Half-long Blood	" 15..	810	
Gardener's Favourite	" 12..	810	Good.
Dewing's Blood Turnip	" 12..	756	
Nonesuch	" 12..	756	



Plan showing ornamental planting about residence of Superintendent, also hedge enclosures and fruit orchards on Experimental Farm at Indian Head, N.W.T.

CARROTS.

Seven varieties sown April 21. Lifted September 27.

Variety.	Bush. per Acre.	Remarks.
Vaughan's Selected Danvers	405	Rough.
Long Red Stump Rooted	378	Smooth, good.
Large Scarlet Nantes	325	Excellent quality.
Early Scarlet Horn	280	" "
Danvers' Half-long	269	Fair quality.
New York Market	216	" "
Scarlet Chantenay	216	Excellent quality.

CABBAGE.

Sown in hotbed April 5th. Transplanted into frames April 26th. Transplanted into garden May 23rd.

Variety.	Fit for Use.	Remarks.
Red Dutch Pickling	Sept. 2	Good size. Solid heads.
Red Drumhead Pickling	" 2	Solid heads. All headed.
Lightning Express	" 2	Solid large heads. "
Burpee's World-beater	" 14	Very fine large heads.
Early Jersey Wakefield	July 15	Early, solid. All headed.
Early Paris	Aug. 3	Early, a few soft heads.
Early Standard	" 12	Early, solid.
Very Early Etampes	July 27	Early, solid. Even. All headed.
Fottler's Early Drumhead	Aug. 3	" " "
Vandergaw	July 27	Early, solid. One of the best.
Surehead	Aug. 2	" "
Nonesuch	Sept. 12	Late, large fine heads.
Late Drumhead	" 12	" "
Drumhead Savoy	Aug. 2	All solid heads.

SOWN IN COLD-FRAME.

Early Standard, Very Early Etampes, Fottler's Early Drumhead, Surehead, Nonesuch, Burpee's All-head, Early Summer, The Lupton, Large Aubervillier's Savoy, Premium Flat Dutch and Red Dutch were all sown in cold-frame on 26th April, and transplanted to garden 15th June. The crop was just as good as from the plants sown in hotbed and was a great deal less trouble.

CELERY.

Sown in hotbed 6th April. Set out in trenches 20th June.

Pink Plume,	in use	10th September.
White Plume	"	24th August.
Paris Golden Yellow	"	12th September.
Dobbie's Invincible	"	"
Evan's Triumph	"	"
Golden-hearted Dwarf	"	"
White Pascal	"	"
Giant White Solid	"	"
Rose-ribbed Paris	"	"

All varieties produced the largest and best crop of celery ever grown on this farm. White Plume was the earliest and best variety, though the heads were not so large as those of other varieties. All were solid and crisp.

CITRONS.

Two varieties, Red Seed and Colorado Preserving, were sown in hotbed on the 19th April. Potted on 9th May and set out on 22nd May. The Red Seed produced a fair crop of well formed fruit, averaging 8 pounds each. Colorado Preserving was more prolific, the fruit averaged 10 pounds each, but was uneven.

CAULIFLOWER.

The following ten varieties were sown in hotbed on 5th April, transplanted to cold frame 25th April, and set out in garden on 25th May. The same varieties were also sown in cold-frame on 26th April, and set out in garden on 13th June. The crop from plants started in hotbed came into use about ten days earlier than that from the cold-frame plants, but no difference could be noticed in the productiveness or quality.

Variety.	Fit for use.	Remarks.
X. X. X	Aug. 6..	Fine solid heads.
High Grade Erfurt	" 8..	Extra fine quality, but small.
Danish Snowball	" 8..	Very white, close heads.
Earliest Dwarf Erfurt	" 3..	Some fine heads; a few imperfect.
The World's Best Snowball	" 6..	Very close heads; all headed.
Early Snowball	" 4..	Very close heads; a few did not head.
Early Favorite	" 8..	Large fine; a few imperfect.
Extra Early Whitehead	" 3..	Very large heads; all perfect.
Gilt Edge	" 10..	" "
Selected Early Erfurt	" 5..	One of the best; all perfect.

CUCUMBERS.

Sown in boxes in hotbed on 19th April, potted on 9th May, and set out in frames in garden on 19th May. None of the varieties were very prolific, but the fruit was large.

Variety.	Fit for use.	Remarks.
Chicago Giant Goliath	July 14..	Large fruit; few on vines.
Chicago Pickling	" 16..	Very few set.
New Siberian	" 3..	Extra good.
Arlington White Spine	" 10..	"
Giant Pera	" 14..	Good crop; even and large.
White Wonder	" 10..	Good fruit; very few set.
Albino	" 10..	" "
Giant White	" 16..	Largest grown.
Livingston's Emerald	" 11..	One of the best.
Evergreen White Spine	" 10..	Good fruit.
White German	" 9..	Very few set.
No. 23	" 10..	Fair crop.

CORN.

Early Giant Kendall, First of All, The Cory, Early Market, Mitchell's Early, Ford's Early Sugar, Early Cory, Squaw Corn, were planted on 16th May. Fit for use 27th August to 7th September. Cut down by frost on 8th September. No corn ripened. First of All, Squaw Corn and Mitchell's Extra Early were fair crops; the others poor.

LETTUCE.

First seeding May 2. Fit to use June 26.

Second seeding May 13. Fit to use August 5 to 10.

Gardner's Favorite.—Fine large heads.
Big Boston.—The best.
Prize head.—Fine heads.
Toronto Market.—Fine heads.
Large Passion.—Very good.
Early Tennis-ball.—Very good.
Blonde Beauty.— "
Mammoth Cabbagehead.—Fine large heads.
The Deacon.— " "
Black Seeded Butter.— " "

Both seedings gave exceptionally good crops.

MELONS.

Musk Melons:—Early Hackensack, Grand Rapids, Emerald Gem and Earliest of All, sown in boxes in hotbed April 19. Transplanted to frames in garden May 19th. Crop good but fruit small.

Water Melons:—Glory of Asia and Phinney's Early, sown in boxes April 19th. Transplanted to frames in garden May 9th. Small crop of good sized fruit. Frames were put over vines on Sept. 1st and the fruit ripened under glass.

MARROWS AND SQUASH.

Mammoth White, Summer Crookneck, Mammoth Chili Squash, and Long White and Early Yellow Bush Marrows were sown in frames in garden on May 13. All produced a fair crop of good sized fruit.

PUMPKINS.

Mammoth King and Connecticut Field pumpkins were sown in frames in garden on May 13. A fair crop of large sized, imperfectly matured pumpkins was the result.

BRUSSELS SPROUTS.

New Giant sown in hotbed April 5. Transplanted to garden May 23. Good crop.

PEPPER.

Cardinal and Long Red sown in hotbed April 5. Potted May 11 and set out May 26th. Neither variety ripened although a large crop of fruit set.

HERBS.

Summer Savory, Mint, Sweet Marjoram and Cress sown on April 21. All did well.

ONIONS.

Sown in hotbed April 4th. Transplanted May 26th. Lifted September 23rd.

Variety.	Bush. per Acre.	Remarks.
New White Victoria	756	Very large. Fair quality.
Prize-taker	756	" Good shape.
White Globe	680	" Good quality.
Large Red Wethersfield	621	Large and even. "
Yellow Globe Danvers	594	"
Cracker Jack	594	Fair size. Good quality.
Sutton's White Leviathan	594	Large size. Fair quality.
Dobbie's Golden Globe	511	Fair size. Good quality.
King of the Earliest	485	Early and good quality.
Giant Rocco	....	Did not grow.

Sown in the open. Sown April 23rd.

Variety.	Bush. per Acre.	Remarks.
Prizetaker	537	Very large but soft.
White Globe	511	Very large. Solid.
Large Red Globe	459	Good crop. Solid.
Yellow Globe Danvers	432	" "
King of the Earliest	432	Fair size. Good crop.
Dwarf Golden Globe	432	Very large.
Oxonion	405	Very fine onions.
Cracker Jack	378	Fair size. Medium quality.
Large Red Wethersfield	378	Good crop.
Large Yellow Flat Danvers	351	Extra fine.
Early Red Wethersfield	270	Firm. All good.
The Queen	162	Good crop. Picklers.

ONION SETTS.

White Multiplier, White Dutch, Red Setts, Bruce's Yellow, Vaughan's Yellow and Simmers' Yellow were set out on 20th April and produced a good crop. White Multipliers were extra fine.

PEASE.

Eleven varieties were sown on 29th April and again on 6th May.

Variety.	1st Seeding fit for use.	Ripe.	Remarks.
Daisy	July 18	Sept. 6	Best variety.
C. P. R	" 26	....	Good green pea. Too late to ripen.
American Wonder	" 9	Sept. 1	Good early pea.
Anticipation	" 26	....	Good green pea. Too late to ripen.
Horsford's Market Garden	" 16	Sept. 7	Good crop, but late.
Alaska	" 9	" 1	Good variety, small.
Nott's Excelsior	" 16	" 7	Good late variety, large and sweet.
Imp. Stratagem	" 25	" 7	Good late variety.
Wm. Hurst	" 9	Aug 31	Best early variety.
Laxton's Charmer	" 25	Sept. 8	Fair late variety.
Heroine	" 25	" 9	Good variety, but too late.

TOBACCO.

Connecticut Seed Leaf sown in hotbed 8th April. Cut 27th August. Good leaf. Will be useful for spraying maple trees for aphis.

PARSNIPS.

Sown 21st April. Lifted 28th October. Dobbie's Selected, 756 bushels per acre, best, even, thick roots; Hollow Crown, 680 bushels per acre, second best, long, thick roots; Maltese, 432 bushels per acre, good quality.

RADISHES.

Ten varieties were sown on 2nd May and again on 13th May, but were cut down by frost on 27th May. The same varieties were resown on 29th May and the crop produced surpassed all previous crops of radishes grown here.

All varieties were fit to use six weeks after seeding.

Rosy Gem; extra good.
Golden Turnip; good.
Early White Lipped; good.
New Pearl Forcing; fair.
Early Scarlet Globe; extra good.
In and Out; extra good.
Extra Early White Olive; one of the best.
Long White Vienna; good.
Rosy Gem (Simmers); extra good.

RHUBARB.

The old bed of Linnæus and the beds of Large Green and Victoria set out last year did well considering the season. A number of the roots of all the varieties died during the summer. Large Green is a large, coarse variety; the other two are very fine.

TOMATOES.

Sown in hotbed 8th April. Repotted 11th May. Set out 30th May, Yellow Plum. Fair crop. Did not ripen.

Earliest of all.	Ripe August	17.	Fair crop.	Imperial.	Ripe August	24.	Fair crop.
Atlantic Prize.	"	29.	"	Dominion Day.	"	24.	"
Early Michigan.	"	25.	"	New Sensation.	"	24.	"
Early Ruby.	"	29.	"				

A few tomatoes of the above varieties were ripe on the dates mentioned, but the greater part of the crop was ripened under glass which was put over vines on 1st September.

FLOWER GARDEN.

In no previous year have we had such a profusion of flowers as during the past season. Commencing in May with a large bed of Tulips there was continuous bloom till snow fell and covered the Pansies. The Tulips were followed by Sweet Williams, Pansies, Dianthus, Phlox, Sweet Peas, Stocks, Verbenas, Petunias and other flowers of equal beauty. Asters alone, among all the varieties tested, did not do well and very few were in bloom when the plants were cut down by frost on September 7th.

The Tulips planted last year were a great success and the variety of colours and size of flowers were a source of pleasure to every one.

Eschscholtzia was also very fine and used as a border produced a very pretty combination of bright yellow, white and purple flowers.

ANNUALS.

Sown in hotbed and transplanted. Sown April 9, transplanted June 25.

Variety.	In Bloom.		Remarks.
	From	To	
Asters	Aug. 23	Sept. 7	Very few flowered.
Carnation Marguerite	" 28	" 7	Flowers small.
Dianthus	" 5	" 7	Very fine.
Stocks	July 19	" 7	"
Pansies	May 15	Nov	"
Antirrhinum	Aug. 15	Sept. 7	Fair show.
Petunia	" 15	" 7	Fine. Not many double.
Verbena	" 10	" 7	Much finer than previously grown.
Linum, Scarlet	" 10	" 7	Good.
Calliopsis			Very fine.
Zinnia			Not as good as usual.
Phlox Drummondi			Extra fine.

Sown in Open

The following were sown in open ground May 20 to 25th. All flowered well and made a good show until frozen:—Sweet Peas, Nasturtium, Sweet Alyssum, Phlox Drummondi, Candytuft, Mignonette, Poppy, Godetia, Salpiglossis and Larkspur.

For gardens in the North-west Territories the following are recommended:—

For sowing in hotbed and transplanting: Stocks, Pansies, Dianthus, Petunias, Verbenas, Calliopsis, Linum Scarlet, Phlox Drummondi, Dahlia, Antirrhinum and Asters.

For Sowing in the Open.

Sweet Peas, Dwarf Nasturtium, Sweet Alyssum, Eschscholtzia, Candytuft, Mignonette, Poppies, Pansies, Godetia, Salpiglossis, Convolvulus Minor, and Larkspur.

PERENNIALS.

Pæony, Scarlet Lychnis, Yellow Flax, Rudbeckia Golden Glow, Sweet William, Columbine, Iceland Poppy, Everlasting Pea, Perennial Flax, Delphinium Grandiflorum, Platycodon Grandiflora and Larkspur.

BULBS.

Tulips, Scilla Sibirica, Irises, and Crocuses.

PERENNIALS.

(From Experimental Farm, Brandon.)

In May last the following perennials were received from Experimental Farm, Brandon, Manitoba, and set out in permanent bed :—

10	*Hemerocallis fulva*—3 grew well.	4	*Eryngium macrocarpa*—3 grew. No flower.
2	*Veronica salurgoides*—Flowered freely.	20	*Coreopsis lanceolata*—3 grew. Very fine.
10	*Grass Pinks*—Flowered freely.	3	*Hesperis matronalis*—2 grew. "
1	*Dictamnus fraxinella*—Died.	25	*Polemonium reptans*—Flowered. "
1	*Dielytra spectabilis*—Died.	3	*Lychnis Haageana H.*— " "
1	*Allium stellarianum*—Grew.	6	*Perennial Larkspur*— " freely.
3	*Aconitum napellus*—1 flowered late.	6	*Viola pedata*—3 " "
8	*Papaver orientale*—2 grew.. No flowers	6	*Campanula Grossekii*—3 " "
7	*Lychnis Chalcedonica*—1 grew.		Fine.

This fall a large collection of perennials was received from the Central Experimental Farm, Ottawa and planted on 10th October.

BULBS.

A collection of Lilies consisting of sixteen varieties, was received from the Central Farm at Ottawa in October, 1897. They were, however, frozen in transit and having arrived too late to be set out were buried in sand in the root cellar. When opened this spring all the bulbs were found to be completely destroyed.

FOREST TREES.

All varieties of trees and shrubs made a most vigorous growth during the past season. Starting early and growing late without a setback and with an abundance of rain, the largest growth of any one year since the farm started has been attained.

In all probability the late growth will be found, next spring, to have been injurious if not fatal, to many of the trees as the wood did not ripen so thoroughly as in shorter and drier seasons.

The American Cottonwood (*Populus Deltoidea*) rushed ahead as soon as spring opened and the growth during the season was in excess of any previous year.

Russian Poplar (*Populus Bereolensis*), which heretofore had given such good satisfaction and promised to be one of the best varieties of trees for the North-west Territories, did not hold its own and the specimens planted in the open failed altogether.

Among the avenues no losses took place except in the avenue of Russian Poplar and one fine native maple tree (*Acer Negundo*) which had been girdled by boys.

The avenue hedges, especially those set out in 1896 and 1897 made very gratifying progress. Ten miles of roads on the farm are now lined by avenues of single trees or hedges.

In the spring of 1895 five ½ acre plots were planted with trees at different distances apart, for the purpose of ascertaining the cost of planting and caring for the

trees until the ground is sufficiently shaded to prevent the growth of weeds, and hence need no further cultivation.

The trees were planted as follows :—

Plot No. 1,	Box Elder, set out	2½	feet apart each way.
" 2	"	3	"
" 3	"	3½	"
" 4	"	4	"
" 5	Green Ash, set out	2½	"

In addition to these were plot No. 6, ½ acre Box Elder seed, sown in rows 2½ feet apart, and plot No. 7, ½ acre Green Ash seed, sown in rows 2½ feet apart.

Following will be found the cost of planting and taking care of trees for the first, second, third and fourth years.

PLOT No. 1—½ ACRE.

Cost of taking up trees		$0 76
1st year, cost of planting,	15 hours	2 25
" scruffling, &c.	12 "	1 80
2nd year "	10 "	1 50
3rd " "	6 "	0 90
4th " " around plot	1 "	0 15
		$7 36

PLOT No. 2—½ ACRE.

Cost of taking up trees		$0 70
1st year, cost of planting,	12 hours	1 80
" scruffling, &c.	15 "	2 25
2nd " "	13 "	1 95
3rd " "	5 "	0 75
4th " " around plot	1 "	0 15
		$7 60

PLOT No. 3—½ ACRE.

Cost of taking up trees		$0 61
1st year, cost of planting,	9 hours	1 35
" scruffling, &c.	11 "	1 65
2nd " "	12 "	1 80
3rd " "	4 "	0 60
4th " "	1 "	0 15
" " hoeing	3 "	0 45
		$6 61

PLOT No. 4—½ ACRE.

Cost of taking up trees		$0 55
1st year, cost of planting,	9 hours	1 35
" scruffling, &c.	10 "	1 50
2nd " "	14 "	2 10
3rd " "	3 "	0 45
4th " "	1 "	0 15
" " hoeing	3 "	0 45
		$6 55

Plot No. 5—½ Acre.

Cost of taking up trees			$0 76
1st year, cost of planting,	18 hours		2 50
" scruffling, &c.	11 "		1 65
2nd " "	9 "		1 35
3rd " "	5 "		0 75
4th " "	1 "		0 15
" " hoeing	3 "		0 45
			$7 61

Plot No. 6—½ Acre Seed.

1st year, cost of making drills,	2 hours	0 30
" " sowing seed	4 "	0 60
" " covering seed	6 "	0 90
" " scruffling, &c.	11½ "	1 72
2nd " "	10 "	1 50
3rd " "	5 "	0 75
4th " "	1 "	0 15
		$5 92

Plot No. 7—½ Acre Seed.

1st year, cost of making drills,	2 hours	$0 30
" " cost of sowing seed,	4 "	0 60
" " cost of covering seed	6 "	0 90
" " cost of scruffling, &c.	10½ "	1 57
2nd " "	9½ "	1 42
3rd " "	12 "	1 80
4th " "	1½ "	0 22
" " hoeing	15 "	2 25
		$9 06

The trees did remarkably well, and these plantations will, in a short time, be among the best on the farm.

Plots No. 1 and 2 required no work this year, with the exception of one scruffling around the plots to kill weeds.

Plots No. 3, 4 and 5 were scruffled and hoed. The latter being planted with green ash suffered from frost in May, which retarded growth, but eventually the plot made excellent progress.

Plot No. 6 (maple seedlings) required only one scruffling, while plot No. 7 (green ash seedlings) was scruffled twice and hoed three times.

NEW PLANTATION.

A new plantation, three-quarters of an acre in extent, was set out last spring with maple, ash and elm, and sand-cherry, which is intended to shade the grounds. Sand-cherry was planted in each alternate row with maple, ash and elm, in the proportion of two maples to one of ash or elm in the other rows. A few elms died shortly after being set out, but the blanks will be filled in spring of 1899.

View on Experimental Farm, Indian Head, N.W.T., showing Hedge Enclosures for protecting vegetables and small fruits.

ARBORETUM.

The arboretum now contains 230 species and varieties of trees and shrubs, which have been planted as follows:—

In 1895, 41 varieties; in 1896, 65 varieties, 6 of which replaced deaths of 1895; in 1897, 75 varieties, 2 of which replaced deaths of 1896, and in 1898, 62 varieties, 5 of which replaced deaths of 1897.

The varieties and species added in 1898 are:—

Abies subalpina (from Laggan, B.C.)
Acer spicatum.
Betula (from Niemetz)
" populifolia.
" rubra.
Berberis Cretica.
" Amurensis.
" Sieboldii.
Caragana frutescens.
Celastrus articulata.
" scandens.
Crataegus No. 9 (from Niemetz).
Cephalanthus occidentalis.
Cytisus nigricans longispicata.
" trifolius.
Cotoneaster No. 10 (Niemetz).
Celtis Audiberti.
Cornus Baileyi.
Gymnocladus Canadensis.
Juglans nigra.
Lycium Chinensis.
Ligustrum Amurensis.
Lonicera gracilis.
Magnus (Black Currant.)
Ptelea trifoliata (Russian Form)
Picea Alcockiana.
Pyrus rivularis (B.C.)
" betulaefolia.
Populus balsamifera Suaveolens.
" nigra.
Prunus tomentosa.
Pinus cembra.
" Murrayana (from Banff).
Ribes Siberica.
" alpinum.
" Gordonianum.
Rhamnus No. 13 (from Niemetz).
Rosa blanda.
" villosa pomifera.
Shepherdia argentea (Red Fruit).
" " (Yellow Fruit).
Spiræa tomentosa.
" sorbifolia.
" ulmifolia.
" ariaefolia.
Syringa pekinensis.
Sambucus laciniata.
" No. 45 (from Niemetz).
Salix longifolia argyophylla.
" Sieboldiana.
" nigricans.
" capraea.
" batavaea.
" Salamoni.
" Nicholsoni purpurescens.
" alba.
" villarsiana.
" repens argentea.
" Forbyana.
Tamarix Amurensis.
Viburnum opulus sterilis.

HEDGES.

One species, Ligustrum Amurense, was this year added to the list of sample-hedges.

ROSES.

Of the twelve varieties of Roses planted in 1897, only four survived the winter. In the fall of 1897 the plants were surrounded by frames into which leaves were packed to a depth of 10 to 12 inches. A snow bank four feet deep also covered the plants.

Following are the surviving varieties with notes on their progress during the past season:—

Lady Helen Stewart, made fair growth but did not bloom.
François Levèt, " "
Madame Victor Verdier, " "
Madame Plantier, made very strong growth, but did not bloom.

FRUIT TREES AND BUSHES.

The season has beeen very unfavourable for fruiting, but exceptionally good for growth, and all varieties of fruit trees and bushes have made rapid progress. There was a large show of blossoms in May, but the frosts on 27th, 28th and 29th of that month killed all except native raspberries which bloom late, and cultivated varieties of red and white currants, gooseberries and raspberries, which produced one-third of an average crop. Black currants were completely destroyed.

FRUIT TREES—CRAB APPLES (*Pyrus baccata*).

The first crab apples ever produced on the farm were grown this year. Needless to say, they were not large, but nevertheless, were perfect apples. Ten trees of Pyrus baccata were fairly well covered with blossoms, but frosts late in May killed all except a few blossoms on one tree from which six crab apples were secured.

PYRUS TREES PLANTED IN 1896.

The following notes show the condition and growth of the Pyrus trees planted in 1896. Received from C. E. F., Ottawa.

Name of Variety.	No. Planted. — Spring, 1896.	No. Living. — Fall, 1898.	Notes on Growth.
Pyrus prunifolia	4	4	Strong growth from tips.
Pyrus baccata edulis..................	4	4	3 strong growth, 1 winter killed.
" " flava..................	1	1	Strong growth healthy.
" " sanguinea	8	7	" "
" " lutea Regel	2	1	Fair growth, kills back ½,
" " genuina................	5	5	Strong growth.
" " cerasiformis....	7	6	" does not kill back.
" prunifola intermedia............	4	4	2 " 2 fair growth.
" " xanthocarpa......	4	4	Strong growth.
" baccata macrocarpa............	3	2	" " healthy.
" " aurantiaca.............	2	2	" " "
" " conocarpa	1	1	" "

SEEDLINGS RAISED AT INDIAN HEAD.

Pyrus prunifolia	19	19	Very strong growth.
" baccata macrocarpa............	8	8	"
" " genuina	8	8	"
" " cerasiformus	13	13	"
" " sanguinea	5	5	"

SEEDLING PLUM AND PYRUS ORCHARDS. COMMENCED IN 1897.

The following will be found a list of the trees added to this orchard in the spring of 1898, with notes on the progress of all varieties of trees in the plots.

Planted 1898.—Cross-bred varieties.

—	Number Planted.	Female.	Male.	Progress.
Row 9......	1	Pyrus baccata	Duchess..................	Fair growth.
	6	"	Wealthy......	Strong "
	4	"	Red Astrachan............	" "
	2	"	Martha Crab.......	Fair "
	2	"	Excelsior....	" "
	4	Pyrus prunifolia	Pewaukee	Strong "
	1	Pyrus baccata	McMahon's White........	Weak "
Row 10	11	Pyrus baccata	Tetofsky	6 strong, 5 fair gowth.
	9	"	Talman Sweet............	7 " 2 "
Row 11.........	1	Pyrus baccata	Yellow Transparent... ..	Strong growth.
	6	"	Swayzie Pomme Gris	4 strong, 2 fair growth.
	5	"	Pewaukee	All strong growth.

Root Grafts.

(Made by grafting scions of some of the more promising of the new cross-bred varieties, on Pyrus baccata or Pyrus prunifolia roots.)

No. planted.	Scion of — Female.	Scion of — Male.	Grafted on Root of	Registered No.	Remarks.
	Row No. 11.				
4	Pyrus baccata	Transcendent	Pyrus prunifolia....	29	Did not grow.
4	"	Wealthy	" baccata	145	2 did not grow ; 1 strong growth ; 1 fair growth.
	Row No. 12.				
3	Pyrus baccata	Duchess	" prunifolia....	142	1 living ; made fair growth.
1	"	Tetofsky...........	" baccata......	45	Did not grow.
5	"	Wealthy	" "	117	1 living ; fair growth.
3	"	Transcendent	" prunifolia....	19	1 " "
5	"	Wealthy	" baccata	118	1 " strong growth.
3	" ...	Orange Crab	" prunifolia....	1	Did not grow.
	Row No. 13.				
2	Pyrus baccata	Wealthy	" baccata	132	Did not grow.
5	"	"	" "	127	1 living ; strong growth.
4	"	Red Anis...........	" "	162	Did not grow.
3	"	Wealthy	" "	122	2 living ; fair growth.
3	"	Orange Crab	" prunifolia....	16	2 " "
2	"	Tetofsky..........	" baccata	79	Did not grow.
1	"	Hyslop	" " ..	30	"
	Row No. 14.				
3	Pyrus baccata	Red Anis...........	" "	164	2 living ; fair growth.
3	"	Tetofsky...........	" prunifolia....	116	3 " "
2	"	Red Anis...........	" baccata	165	1 living ; strong growth.
2	"	Tetofsky..........	" "	46	Did not grow.
2	"	"	" "	53	1 living ; fair growth.
3	"	Hyslop	" "	112	2 " "
2	"	"	" prunifolia....	107	Did not grow.
2	"	Duchess	" baccata	141	1 living ; fair growth.
1	"	Tetofsky............	" "	64	Did not grow.
	Row No. 15.				
2	Pyrus baccata	Red Anis...........	" "	161	"
12	Pyrus, No. 529		....	......	9 growing ; 7 fair growth ; 2 weak growth.

There are still nine rows to be planted in this orchard.

Trees planted in orchard in spring of 1897.

The blanks caused by the deaths of trees in 1897 and the winter of 1897-8 were this spring filled with seedlings of the same varieties grown on this farm.

Out of 1,120 trees living in the fall of 1897 only 20 died during the winter and spring of 1897-8, and these deaths were mainly due to water standing on one of the orchard plots for some time in the spring.

The Caragana Arborescens and Lilac hedges around these four orchard plots are making good progress.

PLUMS.

Seedlings of Weaver.—Planted spring 1894. Twelve trees blossomed, seven of which bore fruit which did not mature and was destroyed by frost in September. The fruit was considerably larger than the Manitoba native wild plum but was not nearly matured when frozen.

Seedlings of Hungarian.—Planted 1894. These trees made a strong and healthy growth but did not bear fruit.

Seedlings of Speer.—Planted 1895. Made very strong growth but have not yet borne fruit.

Seedlings of De Soto.—Planted 1895. Have made strong growth but have not borne fruit.

Seedlings of Voronesh.—Planted 1897. All made very strong growth and are in a healthy condition, but have not yet fruited.

Seedlings of Imperial Blue.—Planted 1895. Partly winter-killed but made some very strong shoots this season.

PLUMS from Central Experimental Farm. Planted 1897.

Variety.	No. Planted.	Remarks.
De Soto	2	Very strong growth.
Aikin	1	Killed back; weak growth from root.
Hoskin	1	Lived to near tip and made very strong growth.

PLUMS received from Chas. Luedloff, *Cologne, Minnesota.* Planted 1896.

Variety.	No. Planted.	No. Living last Report.	Remarks.
Purple Yosemite	2	2	2 strong growth.
Clinton	2	1	1 weak growth.
Missouri Apricot	2	2	Grafted on Sand Cherry and growing from stock.
Deep Creek	2	2	2 strong growth.
Irene	2	2	2 fair growth; kills back.
Milton	2	1	1 strong growth.
Anthony	2	2	2 "
Cottrell	2	2	2 "
Emerson	2	2	Grafted on Sand Cherry and growing from stock.
Weaver	2	2	2 strong growth.
Van Buren	2	2	2 "
Reed	2	2	2 "
Esther	2	2	2 "
Forest Rose	2	2	2 fair growth; partly winter-killed.
Dr. Dennis	2	2	1 strong, 1 weak growth.
New Ulm	2	2	2 strong growth.
Newman	2	2	2 "
Van Deman	2	2	2 "
Yellow Sweet	2	2	1 strong, 1 fair growth.
Chas. Downing	2	2	2 strong growth.
Ocheeda	2	2	2 "
Speer	2	1	1 "
American Eagle	2	2	1 strong, 1 very weak growth.
Col. Wilder	2	2	2 strong growth.
Pepper's Puritan	2	2	2 "
Dunlop No. 1	2	1	1 "
Wood	2	1	1 "
Illinois Iron Clad	2	1	1 "
Crescent City	2	2	2 "
Large Red Sweet	2	2	1 " 1 dead.
Hammer	2	2	1 " 1 fair growth.
Silas Wilson	2	2	2 "
City	2	2	2 "
Richland	2	1	1 "
Gaylord	2	1	1 "
Maldovka	2	2	2 "
Neil's	2	1	1 "
Hawkeye	2	2	1 " 1 fair growth.

Manitoba Native Plums.

(From Frankland, Stonewall, Man.)

Planted in one of the garden enclosures in 1895. None of these have yet borne fruit.

Variety.	No. Planted.	No. Living last Report.	Remarks.
No. 60	2	1	1 strong growth.
27	3	2	2 "
7	2	2	2 fair growth.
29	2	2	1 strong, 1 weak growth.
47	3	1	1 strong growth.
59	1	1	1 "
63	1	1	1 "
53	1	1	1 "
84	2	1	1 "
64	2	2	2 "
31	2	2	2 "
21	3	2	1 " 1 dead.
36	3	2	2 "
15	1	1	1 fair growth.
88	1	1	1 strong growth.
91	2	2	1 fair growth, 1 dead.
65	2	2	1 strong growth, 1 dead.
56	2	1	1 "
67	2	2	2 "
26	2	1	1 "
69	1	1	1 "
40	1	1	1 "
51	1	1	1 "
30	2	1	1 "
61	2	1	1 "
86	1	1	1 "
85	1	1	1 "
89	2	2	2 "
57	2	2	2 "
81	1	1	1 "
41	1	1	1 "
68	2	2	2 "
39	1	1	1 "
67	2	2	2 "

MANITOBA NATIVE PLUM SEEDLINGS.

Grown from seed planted on Experimental Farm, Indian Head.

Transplanted 1895.

Five trees bore fruit this season. Several others were covered with bloom which was destroyed by frost in May. Fruit on three of the five trees was of fair size and quality; on the other two the plums were small and sour. All matured in good time.

CHERRIES.

Seedlings of Carnation.—Planted 1894. The tree planted in garden enclosure again came through the winter safely and made fair growth, but did not blossom.

Seedlings of Lithaur Weichsell.—The six trees planted in 1894 have made strong growth this season and appear to be gradually becoming hardier, but have not fruited.

Seedlings of Olivet.—Two of the four trees planted in 1895 and reported dead in 1897 shot up from roots this year and made strong growth.

Seedlings of Minnesota Ostheim.—35 planted in 1895. 11 living in 1897 and survived last winter, making very satisfactory growth this year.

Rocky Mountain Cherry.—Planted 1895.

Tree No.	1.	Large crop of small fruit.			Late.
do	2.	Fair	do		do
do	3.	Very heavy crop of large fruit.			Early.
do	4.	Small crop of medium fruit.			Late.
do	5.	Large	do	do	do
do	6.	do	do	large fruit.	Ripe August 25.
do	7.	Small	do	do	
do	8.	Fair	do	small fruit.	
do	9.	Large	do	do	Late.
do	10.	Fair	do	large fruit.	Early.
do	11.	do	do	small fruit.	
do	12.	do	do	do	
do	13.	do	do	do	

The fruit is of good flavour and promises to be a valuable addition to the list of fruits easily grown in the North-west Territories. The bushes made very strong growth during the season and fully matured their wood.

Wild Cherry from Nebraska.—Planted 1896. Hardy and strong grower, but has not yet fruited.

Sand Cherry.—A number of the sand cherries planted in 1894 bore fruit this season. The fruit is not so large as that of the Rocky Mountain cherry, but promises to improve under cultivation. It is valuable for jellies.

Mahaleb cherry.—Planted 1897. Fair growth, kills back one-half.

APRICOTS.

Two trees from Turkestan, planted in spring of 1897, lived through the winter and made fair growth.

PEARS.

Longworth.—Planted spring 1897. Winter killed to near ground, and made very weak growth this season.

GRAPES.

Gibb and Bacchus, planted 1895. Growing slowly.

Manitoba Native Wild, planted 1895, making strong growth, but has not yet fruited.

SMALL FRUITS.

WHITE CURRANTS.

White Transparent, planted 1896. Strong growth. Fruited.
White Grape, planted 1896. Fair growth. No fruit.
White Imperial, planted 1897. Fair growth. No fruit.

RED CURRANTS.

Planted in 1896.

Wilder	3	bushes.	Fair growth.	Fruited.
Raby Castle	3	"	"	"
Victoria	3	"	Strong growth.	"
Red Dutch	2	"	"	Small crop.
Versillaise	4	"	"	Good crop.
Fertile d'Angers	3	"	Fair growth.	A few bunches.
Fay's Prolific	2	"	"	Fair crop.
Cherry	4	"	Strong growth.	Good crop.
Prince Albert	3	"	"	"
Lalonde	1	"	Fair growth.	Fair crop.

Planted 1897.

North Star	3 trees.	Strong growth.	No fruit.
Pomona	3 "	"	"

BLACK CURRANTS.

Planted 1896.

Lewis	3 bhs.	Fair growth.	No fruit.	Perry	3 bhs.	Strg. growth.	No fruit.
Oxford	2 "	Strg. "	"	Eagle	4 "	"	"
Winona	2 "	" "	"	Monarch	4 "	"	"
Perth	1 "	Weak "	"	Charmer	4 "	"	"
Ethel	4 "	Strg. "	"	Beauty	4 "	"	"
Eclipse	4 "	" "	"	Ontario	4 "	"	"
Kerry	3 "	" "	"	Stewart	4 "	"	"
Madoc	3 "	" "	"	Clipper	4 "	"	"
Star	4 "	" "	"	Climax	4 "	"	"
Sterling	4 "	" "	"	Black Naples	4 "	"	"
Orton	4 "	" "	"	Dakota Tree Currant	2 bhs.	Strong growth. Fruited for first time.	
Standard	3 "	" "	"				

Planted 1897.

Victoria	3 bushes.	Strong growth.	No fruit.
Crandall	3 "	"	"

RASPBERRIES.

Planted in 1893.

Dr Reider.—Good crop; excellent fruit.
Turner.—Fair crop.
Philadelphia.—Small crop of inferior fruit.

PLANTED IN SPRING 1897.

Garfield	3 canes.	Strg. growth. No fruit.	Sharpe	6 canes.	All dead.
Craig	8 "	All dead.	R. B. Whyte	2 "	"
Muriel	6 "	"	Empire	3 "	"
Percy	2 "	"	Sarah	12 "	1 fair growth. 11 dead.
Caroline	2 "	1 strg. growth. 1 dead.	Miller	6 "	3 strong. 3 dead.
Lady Anne	3 "	1 " 2 "	Kenyon	12 "	3 " 9 "
Sir John	2 "	All dead.	Saunder's Large Red	2 canes.	Both dead.

BLACK AND PURPLE CAP RASPBERRIES.

Schaffer's Colossal and Early Ohio bore a small crop of fruit. Berries small and of medium quality.

Planted 1897.

Charles, 1 plant—Dead.
Royal, 1 do do

GOOSEBERRIES.

Planted 1893.

Smith's Improved.—	Strg. growth.	Fair crop.	Columbus.—	Fair growth	Small crop.
Lancashire Lad.—	Fair growth.	Small crop.	Houghton.—	Strong growth.	Fair crop.
Governess	"	"	Native	"	"

Gooseberries Planted 1897.

Golden Prolific.—	1	weak growth.
Keepsake	2	do
Pearl	2	strong growth.

STRAWBERRIES.

Planted 1895.

Windsor Chief, New Dominion and Pine Apple bore a very small crop of inferior fruit.

Planted 1897.

Scarlet Queen, Brandywine, Gem P., Paris King, Wm. Belt, H. W. Becher, Alpine No. 5. Set out in garden, spring of 1898. Plants healthy and made good growth but did not fruit.

CATTLE.

The herd on the farm at present consists of three Shorthorn bulls and six females; one Ayrshire bull and three Holstein bulls; also three Ayrshire grades, one Holstein grade, one Polled Angus grade and twenty-three Shorthorn grades of which sixteen are two or three-year old steers.

The pure-bred Shorthorns have all been raised on the farm, with the exception of the young bull "Lord Wolseley" just obtained from the Hon. Thomas Greenway, of Crystal City, Manitoba. This bull is from one of the prize-winning cows of the noted Crystal City herd.

On 5th April of this year, an auction sale of stock was held on the farm at which one pure-bred Shorthorn bull, one Polled Angus cow, one Holstein bull and ten Holstein females were disposed of. The following are the names of animals sold:—

Shorthorn bull —"Lord of Qu'Appelle."
Polled Angus cow—"Maid of Skene."
Holstein bull—"Prairie King."
Holstein cow—"Abi."
do —"Siepkje 3rd Queen."
do —"Abi of Assiniboia."
do —"Princess of Assiniboia."
Holstein cow—"Pride of Assiniboia."
do —"Lady of Assiniboia."
Holstein heifer—"Daisy of Assiniboia."
do —"Favorite of Assiniboia."
do —"Pride of Assiniboia 2nd."
do —"Lady of Assiniboia 2nd."

Shortly after the sale the old Holstein bull "Netherland of Brandon" and a Shorthorn bull calf "Katepwe" were disposed of by private sale.

Early in the spring the Ayrshire bull-calf "Dandy Joe of Brandon," obtained from the experimental farm, Brandon, was seriously injured while in the yard with other young stock, and after two months of veterinary attention had to be destroyed. This fall a young Ayrshire bull, "Sir Sydney," has been obtained from the Central Experimental Farm, Ottawa.

The following pure-bred bulls are kept on the farm for service:—

Shorthorn,	"Knight of QuA'ppelle."
"	"Lord Wolseley."
Holstein,	"Earl of Edgeley."
"	"Prince of the Prairie 2nd."
Ayrshire,	"Sir Sydney."

In November fourteen head of Shorthorn grade steers rising three years were secured from Messrs. Gordon and Ironside, of Winnipeg, for use in the feeding tests to be carried on during the winter. To these will be added two grade steers of the same

View on Experimental Farm, Indian Head, N.W.T., showing avenue of Manitoba Maples (*Negundo aceroides*) seven years growth from seed.

age raised on the farm, making three lots of four steers each and two lots of two each. The lots of four each will be fed rations of wheat straw, barley straw and oat straw, and those of two each on Bromus Inermis (Brome grass) and native hay. Each of the above will be supplemented by rations of corn-ensilage and meal.

TEST OF HERD FOR TUBERCULOSIS.

During the month of November, 1897, acting under instructions received from Ottawa, the services of Inspector Burnett and an assistant, of the veterinary department of the North-west Mounted Police, were secured and the tuberculin test applied to all the cattle on the farm. Of the fifty-two animals tested, two only, "Prairie Wildflower," a pure-bred Shorthorn cow, and "Abi 2nd of Assiniboia," a pure-bred Holstein cow, reacted and, by order of the Hon. Minister of Agriculture, were destroyed. Both animals had been tested in 1894 and did not then react.

EXPERIMENTS IN THE FEEDING OF STEERS.

Twelve head of three-year-old steers were divided into four lots of three each and fed from November 13th, 1897, to March 5th, 1898.

Lot No. 1 was fed Brome hay and ensilage;
Lot No. 2 was fed wheat chaff and ensilage;
Lot No. 3 was fed threshed Brome grass, ensilage and bran, and
Lot No. 4 was fed native hay, ensilage and bran.

To each of the animals fed as above was given the same ration of ensilage and in addition two pounds of meal per day during the second month, four pounds during the third month and six pounds per day during the last month of the test. The rations were in the proportion of two pounds ensilage to each pound of dry feed. The meal consisted of two parts ground barley and one part ground wheat.

The animals were fed three times a day and were fed on a uniform ration for two weeks before the test was begun.

MONTHLY AND TOTAL GAINS OF EACH LOT OF STEERS.

Lot No.	Principal Ration.	Gain. December	Gain. January.	Gain. February.	Gain. March.	Gain. Total.
1	Brome hay	130	45	165	90	430
2	Wheat chaff	.....	95	110	110	315
3	Threshed Brome hay	10	165	150	30	355
4	Native hay	60	190	145	65	460

The total amount and estimated value of feed consumed during the feeding period of 112 days was as follows:—

LOT FED ON BROME-HAY.

10,432 lbs.	Ensilage at \$2 per ton	\$10 43
5,344 "	Brome-hay at \$5 per ton	13 36
933 "	Meal at $\frac{2}{3}$c. per lb	6 22
		30 01

LOT FED ON THRESHED BROME-HAY.

10,432 lbs.	Ensilage at $2 per ton	10 43
5,344 "	Threshed Brome-hay at $4 per ton	10 69
933 "	Meal at ⅔c. per lb	6 22
500 "	Bran at $14 per ton	3 50
		30 84

LOT FED ON NATIVE HAY.

10,432 lbs.	Ensilage at $2 per ton	10 43
5,344 "	Native hay at $5 per ton	13 36
933 "	Meal at ⅔c. per lb	6 22
500 "	Bran at $14 per ton	3 50
		33 51

LOT FED ON WHEAT-CHAFF.

10,432 lbs.	Ensilage at $2 per ton	10 43
5,344 "	Wheat chaff at $2 per ton	5 34
933 "	Meal at ⅔c. per lb	6 22
		21 99

SUMMARY OF RESULTS.

Lot.	First Cost.	Value of Feed Consumed.	Total Cost.	Sold for.	Profit on Lot.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
3 steers fed on Brome hay	99 00	30 01	129 01	156 40	27 39
3 " threshed Brome hay	100 92½	30 84	131 76½	160 80	29 03½
3 " native hay	99 00	33 51	132 51	166 60	34 09
3 " wheat chaff	97 76¼	21 99	119 75¼	164 40	44 64¾

SWINE.

The herd on the farm consists of twelve animals as follows:—

Improved Chester White	1 boar.		
Berkshire	1 "	2 sows.	
Large Yorkshire	1 "	1 "	1 barrow.
Tamworth	2 "	2 "	1 "

Since my last report one Berkshire boar, two Large Yorkshire boars, five Large Yorkshire sows and two Tamworth sows have been sold to farmers for breeding purposes.

POULTRY.

Four breeds are kept, Plymouth Rock, White Wyandotte, White Leghorn and Black Minorca. The breeding pens were made up on March 10th and eggs were gathered as follows:—

Breed.	March.	April.	May.	June.	July.	August.	Total.
Plymouth Rock	35	96	108	....	45	23	307
White Wyandotte	26	82	76	....	32	20	236
White Leghorn	25	73	104	12	39	19	272
Black Minorca	22	52	84	....	24	22	204

The hens were allowed to run together after August 31st. Seventeen cockerels, eleven pullets and twenty-seven settings of eggs were sold to farmers during the year.

THE FLOCK NOW CONSISTS OF

Plymouth Rocks	19 birds.
White Wyandotte	16 "
White Leghorn	18 "
Black Minorca	10 "

HORSES.

At present there are nine heavy working horses, two carriage horses, two 2-year-old colts, one colt 6 months old, and one herd pony on the farm. In the spring the two 2-year-olds will be able to take the place of a team of the older animals which were brought up when the farm was started and are now too old to be of much value.

BEES.

Not much success can be reported in bee culture. Last fall three hives were put in the Superintendent's house in an unused room where the temperature could be regulated. All came through the winter safely and early in May started work on the poplar.

Only one swarm was obtained during the summer.

Two of the old swarms and the new one were well supplied with honey for the winter when put away this fall. The other swarms, however, had very little and the deficiency had to be made up from the stronger hives.

The two old swarms weighed 50 lbs. each and the new one, which is in a small hive, 40 lbs. when stored for winter.

Supers were put on during June, but except in the new hive no honey was stored. The new swarm partially filled six one-lb. sections, excepting which no honey was obtained from any of the swarms.

WEEDS.

During the past season weeds on the farm have not been more troublesome than in previous years. Tumbling Mustard, which for several years has been the cause of much expense, gave very little trouble as the trees on the west and north side of the farm keep all perambulating specimens from being blown in. Stink-weed was rather more abundant than usual, but all plants are being attended to as well as possible. Pigweed was the cause of a decreased yield in several acre plots of oats and barley, the weeds having obtained a start when the grain was cut down by frost. Pigweed was very prevalent throughout the country and in many cases caused serious loss. Districts where moisture was insufficient to cause early germination of the grain, thereby giving weeds a chance to grow, suffered most.

DISTRIBUTION OF SAMPLES OF GRAIN, FOREST TREES, TREE SEEDS, POTATOES, ETC.

During the months of March, April and May, the following distribution of products of the farm was made to applicants throughout the territories of Assiniboia, Alberta and Saskatchewan. The number of applications was largely in excess of the supply available for this purpose.

Samples of	Number.	Total.
Grain—Wheat, 3-lb. bags	177	
" Oats "	332	
" Barley "	182	
" Pease "	205	
" Rye "	11	
" Flax "	10	
		917
Forest Trees—		
Cuttings—Artemisia Abrotanum	6,050	
" American Cottonwood	3,800	
" Willow	2,080	
		11,930
Seedlings—Maple (Box Elder)	6,500	
" Caragana Arb.	2,640	
" Ash	2,900	
		12,040
Fruit Seedlings—Plums	... .	780
Small seeds, packages	172	
Potatoes, 3-lb. bags	381	
Rhubarb, roots	660	
Bromus Inermis Grass seed, 1-lb. bags	644	
Agropyrum Tenerum "	315	
Ash seed "	165	
Manitoba Maple seed "	424	

SUMMARY.

Samples.	Bags and Packages.	Roots, Cuttings and Seedlings.
Grain	917	
Forest trees and shrubs—cuttings	....	12,040
" " seedlings	....	11,930
Fruit trees—seedlings	....	780
Small seeds	172	
Tree seeds	589	
Grass seed	959	
Potatoes	381	
Rhubarb, roots	....	660
	3,020	25,410

EXHIBITIONS ATTENDED.

During the month of July the Winnipeg Industrial Exhibition in Winnipeg, Manitoba, was attended with an exhibit of products of the farm, consisting of grain in straw, grasses and threshed grain in bottles.

In August the united fair of the districts of Indian Head, Qu'Appelle Station and Fort Qu'Appelle, held at Qu'Appelle Station, was attended and an exhibit made similar to that at Winnipeg with the addition of vegetables from this farm and a very fine collection of fruit from the Experimental Farm for British Columbia at Agassiz.

In October an exhibit of vegetables and roots from Indian Head farm and a collection of apples from Agassiz was made at the Wapella Agricultural Society's fair held at Wapella, Assiniboia.

MEETINGS.

Meetings called by the North-west Dairymen's Association at Calgary and Olds, Innisfail, Red Deer, Lacombe, Wetaskiwin, Leduc, Edmonton and St. Albert, on the line of the Calgary and Edmonton Railway, were attended in March last. Except at Calgary the meetings were well attended. The work carried on on the Experimental Farms, the best methods of working land to meet climatic conditions, and to produce feed for dairy cattle were the principal topics referred to by myself.

The North-west Dairymen's Association delegates (Mr. Hopkins, president, Mr. Watson, vice-president, and Mr. Trant, secretary, spoke on dairy work exclusively.

VISITORS.

Visitors to the farm were more numerous during the past summer than ever before. The press excursion from Wisconsin and Minnesota made a short visit to the farm on their return from British Columbia. A large excursion from Moosejaw and points east to Qu'Appelle Station spent a day on the farm. With the farmers from this district and citizens of Indian Head, the visitors that day numbered nearly 1,500 people.

CORRESPONDENCE.

During the twelve months ending October 31, 1898, 4,702 letters were received, and 5,075 letters mailed from this office. In letters received, reports on grain and other samples are not counted, and in letters mailed, circulars of instruction *re* grain and other samples are not included.

METEOROLOGICAL.

Month.	Highest Temperature.		Lowest Temperature.		Snow-fall.	Rainfall.		Hours of Sunshine.
	On.	Degrees	On.	Degrees	Inches.	No. of Days.	Inches.	
1897.								
November	1	66	27	—32	13	....	....	53·4
December	28	42	1	—32	....	....	....	58·6
1898.								
January	11	33	31	—23	4	....	....	95·2
February	12	38	17	—30	2	....	....	74·3
March	6	35	27	—32	3	....	....	113·9
April	26	77	5	—10	....	1	·75	198·8
May	24	84	28	20	....	1	·5	251·3
June	19	95	14	27	....	11	4·14	182·4
July	12	99	20	35	....	6	3·36	243·5
August	8	90	12	32·5	....	4	4·	210·2
September	27	89	9	25	....	5	4·03	202·6
October	13	56	21	16	6	5	1·25	66·2
Total	....	....	....	....	28	33	18·03	1750·4

I have the honour to be, sir,

Your obedient servant,

ANGUS MACKAY,

Superintendent.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., 30th November, 1898.

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my report of progress made and work done for this, the tenth year, since work was commenced on this farm.

As in the season of 1896, so last year the coldest weather experienced during the winter was in November. The lowest temperature recorded here during last winter being 10 degrees above zero, the 28th of that month.

The winter was mild with a very light snowfall, and only a light rainfall. The spring, however, did not open very early, and April and May were so cold that growth was quite backward, and it was not until the middle of the latter month that really warm spring weather set in. June was rather unusually wet, insuring a heavy hay crop, but from early in July until after the most of the harvest was secured, the weather was very hot and dry. In some cases grain was ripened by the intense heat, too rapidly to fill properly, but the dry harvest weather cured it in fine condition, producing a bright, clean sample. The crop of hay has been very heavy throughout the province, and grain and roots of all kinds a good average. The land on the experimental farm having a light porous gravelly soil, suffered more from the drought than heavier soils did, lessening the yield of grain and roots in many cases, but on the whole the experimental farm crops are fairly good, as will be seen from the particulars herewith given.

HEDGES.

The sample hedges have continued to grow finely, and are attracting considerable attention. A good many visitors inspecting them with a view to choosing one for their own grounds.

FOREST TREE PLANTATIONS.

The forest tree plantations are making very strong and healthy growth in the cleared land on the level, and many of those planted on the mountain are making considerable progress.

ORNAMENTAL TREES AND SHRUBS.

These trees and shrubs have, with scarcely an exception, continued to make satisfactory growth. Some of the shrubs began to bloom in March, and the roses, Japanese hydrangeas, and some of the spiræas are still in bloom.

NUT TREES.

The Spanish and Japanese chestnuts fruited this year, and some of the nuts were very fine. The walnuts have all made a strong growth, and the variety known as Juglans max cordiformis, a heart-shaped nut, produced a fair crop.

ALMONDS.

Both hard and soft shelled varieties bloomed, but only the hard shelled sort fruited.

FILBERTS.

The spring was unfavourable for this fruit. The male flowers developed early in March, and the pollen was wasted before many of the female blossoms were ready to receive it, and consequently but few of them were fertilized. Perhaps when the bushes get age this may be remedied.

DISTRIBUTION OF SAMPLES.

A considerable number of samples of seed grain, potatoes, tree seeds and small fruit plants have been distributed during the past year. The following is a list of what was sent out in this way:—

Wheat, 3-pound packages	43
Oats " "	61
Pease " "	47
Barley " "	29
Potatoes	137
Scions and cuttings	134
Small fruits	71
Tree seeds and nuts	67
	589

BEES.

The bees have done very well this year, and although one or two swarms went away, we have seven at present, each one apparently well provided with honey for the winter.

STOCK.

The cattle mentioned in my report for last year as having the red water have not recovered, although they have been treated under the directions of a veterinary surgeon. The disease appears to be intermittent, sometimes almost, or quite disappearing for a while.

The live stock on the farm at present consists of the following:—Six working horses, nineteen head of cattle, six sheep, six pigs and sixty fowls.

BUILDINGS.

No new buildings have been erected this year, but material is being got ready for a pig house which it is proposed to erect before spring.

FENCING.

About three-quarters of a mile of wire fence was put up on the west side of the farm, and that part is now enclosed and protected.

BREAKING.

About ten acres of new land have been broken up this year; a part of it has been under crop this season, and the remainder will be ready for use next spring.

General view of the Experimental Farm at Agassiz, British Columbia, from the mountain

EXPERIMENTS WITH OATS.

Sixty-six varieties of oats were tested under conditions as nearly similar as was possible. All the seed was treated with bluestone before sowing, and there was very little smut. A few samples were rusty, but in most cases the injury was not severe. White Russian, Mortgage Lifter and Olive are among those that suffered from rust last year. White Wonder, Victoria Prize and Abundance, the remainder of those rusted last year were not affected this year, the straw being clean and bright.

These were all sown on the 18th April. The soil was a sandy loam which had been in clover for two years previous. It was ploughed in September, 1897, when the third crop of clover was in bloom, and the sod well cut up with the disc-harrow. This was disc-harrowed again early in the spring, and a third time later, and harrowed with the smoothing-harrow before sowing. The clover turned under was the only manure this land has ever received. The size of the plots was one-twentieth of an acre each.

Oats.—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs	Lbs	
Danish Island	Aug. 13	117	52	Stiff	12	Half-sided	5,400	85	10	38½	None.
Imported Irish	" 9	113	48	"	10	Branching	4,000	72	38	40¼	"
Bavarian	" 11	115	48	"	10	"	4,600	66	16	36¼	Little.
American Triumph	" 10	114	46	"	9	"	4,100	64	4	36	None.
Cromwell	" 10	114	58	"	11	Half-sided	4,140	62	32	38	"
Golden Tartarian	" 11	115	44	"	10	Sided	4,400	61	28	36	"
White Giant	" 11	115	42	"	10	Half-sided	4,400	61	18	36½	"
Prolific Blk. Tartarian	" 10	114	44	"	10	Sided	4,000	61	18	34¼	"
Holstein Prolific	" 12	116	50	"	11	Branching	3,880	60	22	36¼	"
Golden Beauty	" 11	115	46	"	10	"	5,000	59	14	35¼	"
Lincoln	" 11	115	44	Feeble	9	"	4,600	59	4	37	Little.
California Blk. Prolific	" 13	117	42	"	11	Sided	4,200	58	28	35	None.
Black Mesdag	" 4	108	46	Stiff	11	Half-sided	3,900	58	8	36	"
Banner	" 11	115	50	"	10	Branching	3,900	57	32	35	"
Wide Awake	" 13	117	48	Medium	9	"	4,400	57	22	36¼	"
Early Archangel	" 12	116	44	"	10	"	4,200	57	22	40¼	"
Cream Egyptian	" 9	113	46	"	10	Half-sided	4,000	57	12	36½	"
Black Beauty	" 8	112	48	Stiff	10	Branching	3,700	57	12	38¼	"
Mennonite	" 9	113	42	"	9	"	3,600	57	2	36¼	"
Mortgage Lifter	" 9	113	52	Medium	11	"	4,600	56	26	40½	Little.
White Wonder	" 9	113	50	"	9	"	4,000	56	21	41	None.
Columbus	" 10	114	46	Stiff	10	"	4,100	56	..	35¾	"
Wallis	" 11	115	48	"	10	"	3,500	55	20	37	Little.
Early Gothland	" 10	114	46	"	9	Half-sided	3,900	55	20	37¾	None.
Winter Grey	" 8	112	48	"	11	Branching	4,100	55	10	41¼	"
Coulommiers	" 17	121	46	"	10	"	4,200	55	..	36	Considerably.
Early Blossom	" 12	116	42	Medium	9	Half-sided	4,000	54	24	38¾	None.
Improved Ligowo	" 12	116	42	"	10	Branching	3,800	54	14	38¼	"
Early Maine	" 9	113	48	Stiff	9	"	4,200	54	4	36	"
Victoria Prize	" 8	112	45	"	12	"	3,800	53	18	39¼	"
Rosedale	" 10	114	50	"	10	Sided	4,200	53	8	37½	"
Thousand Dollar	" 4	108	42	Medium	10	Branching	4,100	52	32	38	"
Rennie's Prize	" 9	113	50	"	11	"	3,600	52	32	38½	"
Abyssinia	" 12	116	44	"	10	Half-sided	4,160	52	22	35¾	"
Scottish Chief	" 4	108	44	Stiff	10	Branching	3,900	52	12	37	"
American Beauty	" 12	116	46	"	10	"	3,500	51	26	35½	"
Olive	" 12	116	48	Medium	10	Sided	3,700	51	16	37	Little.
Medal	" 11	115	50	Stiff	12	Branching	4,000	51	6	38	None.
Abundance	" 12	116	44	"	10	"	3,900	51	6	35¼	"
Improved American	" 12	116	48	"	11	"	3,600	50	30	38	"
Russell	" 10	114	52	"	13	Half-sided	3,900	50	20	38¾	"
Newmarket	" 10	114	44	"	10	Branching	4,080	50	20	40	"
White Schonen	" 12	116	48	Medium	9	"	3,200	50	15	36½	"
Master	" 9	113	44	Stiff	9	"	3,200	50	10	37¼	"
Oxford	" 12	116	48	"	10	Half-sided	3,600	50	10	36¾	"

OATS—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs	Lbs.	
Bonanza.........	Aug. 9	113	48	Medium..	10	Branching	4,200	50	..	37¼	Slightly.
Hazlett's Seizure.....	" 11	115	54	Stiff......	10	" .	2,900	50	..	39	None.
Siberian O.A.C.......	" 12	116	44	Medium..	9	Sided.....	3,900	48	28	36	"
Early Golden Prolific.	" 13	117	50	Stiff.....	10	Branching	2,800	48	18	36	"
Oderbruch......	" 13	117	48	Medium..	11	" .	3,200	48	8	38¾	"
Great White Maine...	" 17	121	48	Weak	10	Sided.....	6,400	48	8	36¼	Considerably.
Holland............	" 10	114	46	Stiff	12	"	4,200	48	..	34	None.
Miller	" 12	116	48	Medium..	9	Branching	3,000	47	28	37	"
Pense ...., ...	" 12	116	48	Stiff	10	Sided.....	3,700	47	..	38¼	"
Welcome............	" 11	115	52	Weak	11	Branching	3,500	46	28	36½	Slightly.
Golden Giant....	" 13	117	54	Medium..	12	Sided.....	3,200	46	20	37¾	None.
Doncaster Prize......	" 10	114	58	Stiff......	10	Branching	4,400	45	30	40¼	"
Joanette............	" 10	114	38	Weak	9	" .	2,800	45	30	36½	"
Poland.........	" 9	113	48	Medium .	10	" .	3,400	45	25	38½	"
King...............	" 12	116	50	Stiff	10	" .	3,000	44	24	37¾	"
Flying Scotchman....	" 9	113	50	Medium..	10	" .	3,000	44	24	39½	Slightly.
Buckbee's Illinois	" 12	116	44	" ..	10	" .	4,400	44	4	36	None.
Brandon............	" 11	115	60	Stiff	12	" .	3,400	43	28	38¾	"
White Russian.......	" 8	112	50	"	10	" .	2,700	43	18	35	Slightly.
Early Dawson.......	" 8	112	52	"	11	Sided.....	3,200	42	32	41	"
Prize Cluster.........	" 12	116	46	Medium..	10	Branching	3,000	42	12	39¼	None.

SEED OATS TREATED FOR SMUT.

Comparative tests of three varieties of seed oats were made, treated with different remedies for the prevention of smut.

The soil on which these tests were made was a warm sandy loam which had been in Indian corn in 1897. The land was broken up in 1895 and sown with pease that year. It was used for roots in 1896 and has not yet received any manure or fertilizer.

Lot No. 1 in each variety was soaked in Bordeaux Mixture for four hours. This mixture was made with 4 pounds of sulphate of copper and 4 pounds of lime to 40 gallons of water.

Lot No. 2 was soaked in a solution of formalin for two hours, composed of 3 ozs. of formalin to 10 imperial gallons of water.

Lot No. 3 was soaked for two hours in a solution of formalin consisting of 4½ ozs. of formalin to 10 imperial gallons of water.

Lot 4 consisted of seed from the same samples untreated.

All these were sown on the same day, on soil as nearly uniform as possible, at the rate of two and a half bushels per acre, and all the heads, both smutty and clean, on an average square yard were counted.

No. of Plot.	Name of Variety.	Name of Fungicide.	Date of Sowing.	Date of Ripening.	Length of Heads.	Length of Straw.	Per cent of Smutty Heads.	Per cent of Clean Heads.
					In.	In.		
1	Flying Scotchman. ...	Bordeaux mixture........	May 6..	Aug. 13..	11	50	4	96
2	" "	Formalin, 2 to 1,000.......	" 6..	" 13..	11	50	4	96
3	" "	" 3 to 1,000.	" 6..	" 13..	10	52	2	98
4	" "	Untreated........... ...	" 6..	" 13..	9	48	9	91
1	Doncaster Prize..	Bordeaux mixture.........	" 6..	" 13..	11	48	4	96
2	" "	Formalin, 2 to 1,000. ...	" 6..	" 13..	9	46	7	93
3	" "	" 3 to 1,000.	" 6..	" 13..	10	48	5	95
4	" "	Untreated................	" 6..	" 13..	9	42	17	83
1	Mortgage Lifter........	Bordeaux mixture.........	" 6..	" 13..	10	44	4	96
2	" "	Formalin, 2 to 1,000.......	" 6..	" 13..	10	44	4	96
3	" "	" 3 to 1,000......	" 6..	" 13..	10	48	3	97
4	" "	Untreated................	" 6..	" 13..	10	44	8	92

EXPERIMENTS WITH BARLEY.

Forty-one varieties of barley were sown in test plots of one-twentieth of an acre each. Nineteen of these were two-rowed, and twenty-two six-rowed sorts. All were sown on 21st April, which was three days later than the barley plots were sown last year, and the date of ripening is in some cases ten days earlier than that of last year. This was owing to the very hot and dry weather experienced here during July and August, which hastened the ripening of all the grain crops and thereby lessened the yield. There was no rust on any of the barley plots.

The soil was a sandy loam and the previous crop was corn. This land was ploughed in the spring and harrowed with disc-harrow and smoothing-harrow before sowing. It has not received any fertilizer since it was broken up.

BARLEY—TWO-ROWED—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per plot.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
Kinver Chevalier............	Aug. 5..	106	36 to 40	Stiff	3½ to 4	240	40	..	51¼
Beaver..	" 2..	103	34 to 38	"	3 to 3½	220	39	8	52
Prize Prolific..............	" 5..	106	34 to 38	"	3½ to 4½	215	36	12	49
Pacer	" 2..	103	36 to 38	"	2½ to 3	200	34	8	51¾
Danish Chevalier...........	" 5..	106	32 to 36	"	3 to 4	165	33	16	52¼
Newton	" 2..	103	32 to 36	"	2½ to 3	165	33	16	52½
French Chevalier...........	" 5..	106	24 to 30	"	3 to 3½	150	31	32	52¾
Bolton................. ...	" 2..	103	32 to 36	"	2 to 3	160	31	12	50¼
Sidney.....................	" 3..	104	34 to 38	"	3 to 4	175	30	40	53
Leslie.	" 2..	103	32 to 36	"	3 to 4	155	30	..	51
Victor.....................	" 2..	103	32 to 38	"	2½ to 3	200	29	8	53¼
Dunham	" 2..	103	36 to 40	"	3 to 3½	195	29	8	50½
Logan	" 2..	103	40 to 46	"	3 to 4	200	29	8	51
Canadian Thorpe............	" 5..	106	34 to 38	"	2 to 3	120	27	44	52
Monck.........	" 5..	106	36 to 40	"	3 to 4	190	25	40	51½
Kirby	" 2..	103	30 to 34	"	2½ to 3	175	25	40	48¾
Nepean.................. ...	" 2..	103	36 to 40	"	3 to 3½	165	25	..	51¾
Surprise	" 2..	103	32 to 38	"	3 to 3½	145	25	..	50½
Thanet	" 5..	106	24 to 30	"	2½ to 3	140	22	44	51¼

BARLEY—SIX-ROWED—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Phœnix	Aug. 1	101	40 to 42	Stiff	3	220	40	..	50
Royal	July 30	99	39	"	3½	218	38	16	50¾
Mensury	" 30	99	44	"	4	220	37	24	49¾
Argyle	Aug. 1	101	42	"	2½	217	36	32	49½
Empire	" 1	101	38	"	3	225	36	12	49¼
Summit	" 2	102	42	"	3½	221	35	40	50¼
Champion	July 27	96	50	"	3½	195	35	20	42½
Pioneer	" 30	99	40	"	3½	200	35	20	50½
Trooper	Aug. 1	101	38	"	2½	210	35		50¼
Baxter	July 30	99	40	"	3½	221	34	28	49¼
Excelsior	" 27	96	48	"	3	210	34	28	42¾
Mansfield	Aug. 1	101	50	"	3	204	34	28	50¼
Common	" 3	103	36	"	2½	165	34	28	41½
Stella	" 2	102	48	"	3½	210	34	8	49¾
Odessa	" 1	101	40	"	2½	220	34	8	47¾
Success	July 27	96	36	"	2½	160	32	44	48¼
Vanguard	" 30	99	38	"	3	180	31	22	50
Oderbruch	" 30	99	37	Weak	3	195	29	28	48¾
Petschora	" 30	99	34	"	3	190	28	36	48¼
Nugent	Aug. 1	101	36	Stiff	3½	205	28	16	49¾
Rennie's Improved	" 1	101	42	"	2½	180	27	44	49¾
Blue Barley	" 2	102	33	"	2½	153	26	32	43¼

EXPERIMENTS WITH SPRING WHEAT.

Forty-four varieties of spring wheat were tested in 1898. They were sown on 15th April on plots of one-twentieth acre each, on a light clay loam which had produced a crop of barley in 1897 and pease following clover in 1896. The land was ploughed in April, 1898, and disc-harrowed and harrowed with the smoothing-harrow before sowing. This land received a light dressing of manure in the autumn of 1894. No fertilizer has been applied since.

The yield promised to be very good in the early summer, but the hot dry weather forced the ripening forward so rapidly that the heads did not fill out nor was the grain as plump as it should have been. There was no rust and only a very little smut in one or two varieties.

SPRING WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
White Connell	Aug. 9	116	42	Stiff, bright	3	Bald	3,800	31	20	62¼
Huron	" 8	115	40	"	3½	Bearded	3,500	30	..	63
Black Sea	" 6	113	46	Weak	3	"	3,500	29	40	61¾
Monarch	" 12	119	40	Stiff	2½	Bald	3,900	29	20	61½
Progress	" 8	115	48	"	3	"	4,000	29	..	61
Beaudry	" 8	115	38	Weak	2¾	Bearded	3,960	29	..	63
Vernon	" 8	115	38	Stiff	3	"	3,500	28	40	62½
Preston	" 8	115	40	"	3	"	3,300	28	40	62¼
White Russian	" 9	116	38	"	3½	Bald	2,900	28	30	63
Plumper	" 6	113	40	"	2½	Bearded	3,700	28	20	61¾
Red Fife	" 8	115	50	"	3	Bald	4,080	28	20	62¼
Wellman's Fife	" 9	116	44	"	3	"	3,000	28	..	62
Admiral	" 8	115	44	"	4	"	3,600	28	..	62
Colorado	" 8	115	40	Medium	3	Bearded	2,900	28	..	62
Countess	" 5	112	42	Stiff	2½	Bald	3,520	27	50	64
Rideau	" 5	112	42	"	2½	"	3,880	27	45	62½
Old Red River	" 12	119	40	Medium	3	"	3,000	27	40	61¾
Hungarian	" 6	113	44	"	3½	Bearded	3,600	27	40	62¼
Alpha	" 8	115	48	Stiff	3	Bald	3,800	27	35	61¾
Blenheim	" 12	119	44	"	3½	Bearded	4,800	27	35	62
Rio Grande	Aug. 9	116	38	Medium	3	Bearded	3,200	27	30	61¾
Golden Drop	" 6	113	40	Stiff	3	Bald	4,400	27	20	62¼
Ladoga	" 6	113	38	Medium	3	Bearded	3,700	27	10	63
Campbell's White Chaff	" 8	115	42	Stiff	3	Bald	3,720	27	..	62
Dion's	" 12	119	36	"	3½	Bearded	3,900	27	..	61¼
Goose	" 12	119	40	"	3	"	3,800	26	40	64
Dufferin	" 5	112	40	"	2½	"	3,500	26	20	62¼
Blair	" 6	113	36	Medium	2½	Bald	2,600	26	20	62
White Fife	" 9	116	38	"	2	"	3,200	26	10	61¼
Pringle's Champlain	" 8	115	46	"	3	Bearded	3,200	26	..	62¾
Red Fern	" 9	116	40	Stiff	2½	"	4,100	26	..	62½
Dawn	" 1	108	36	"	3	Bald	3,300	25	40	62¾
Beauty	" 8	115	42	Medium	3	"	3,780	25	40	63
Emporium	" 8	115	46	Weak	3½	Bearded	3,700	25	30	62¾
Cross	" 12	119	40	Stiff	3	Bald	3,800	25	20	61
Herisson Bearded	" 8	115	36	Weak	2	Bearded	2,900	25	10	60¾
Advance	" 9	116	40	Medium	3	"	4,000	25	10	65¼
Mason	" 5	112	38	"	3	Bald	3,300	25	..	62¼
Amber	" 9	116	40	"	2	"	3,200	25	..	62¼
Captor	" 6	113	36	"	3	"	3,700	24	..	61½
Harold	July 30	106	38	Weak	2½	Bearded	3,500	23	40	62
Percy	Aug. 6	113	40	Medium	3	Bald	3,600	23	30	62½
Stanley	" 6	113	44	"	3	"	3,360	23	30	60½
Crown	" 6	113	42	Stiff	3	Bearded	3,600	23	..	62¼

EXPERIMENTS WITH PEASE.

Forty-seven varieties of pease were sown on fairly uniform land. The soil was black loam. Early in July these plots promised an extra heavy yield, but the hot weather prevented the fullest development of the pod, by hastening the ripening. King, as in 1897, leads the list in yield. All were sown on same date, 14th April, and the size of the plots was one-twentieth of an acre each.

Pease.—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Pod.	Kind of Pea.	Weight of Straw per Plot	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs
King	Aug. 8	115	54	Clean and bright..	3	Large ..	360	39	..	64¾
White Wonder	" 1	108	38	" ..	2½	Medium	225	39	..	64
Agnes	" 9	116	60	" ..	3½	Large ..	230	37	20	63½
Mummy	" 8	115	58	" ..	3	Medium	290	37	..	62
Macoun	" 9	116	72	" ..	3	Large ..	295	36	20	60¾
Elephant Blue	" 6	113	50	" .	3	Medium	270	36	..	63
Prince Albert	" 6	113	58	" ..	2½	Small ..	270	35	20	61¼
Crown	" 3	110	54	" ..	3	" ..	240	35	..	62½
Daniel O'Rourke	July 30	106	50	" ..	2½	" ..	220	34	40	63
Cooper	Aug. 4	111	52	" ..	3	Large ..	225	34	30	60¾
Picton	" 8	115	76	" ..	3½	Medium	230	34	20	61¾
Multiplier	" 10	117	74	" ..	3	Small ..	244	34	..	62
Gregory	" 8	115	62	" ..	4	Medium	250	34	..	60¾
Fergus	" 9	116	60	" ..	3½	Small ..	260	33	50	61½
Creeper	" 2	109	62	" ..	3	" .	245	33	40	61
German White	" 3	110	60	" ..	3½	Medium	195	33	20	62¾
Golden Vine	" 9	116	64	" ..	2½	Small ..	215	33	20	60½
Victoria	" 9	116	74	" ..	3	" ..	255	33	..	61
Alma	" 9	116	60	" ..	3	" ..	243	32	40	64¼
Pride	" 5	112	46	" ..	3¼	Large ..	215	32	40	62½
Lanark	" 4	111	62	" ..	3	" ..	200	32	20	65
Vincent	" 3	110	54	" ..	3½	" ..	210	32	10	62½
New Potter	" 6	113	62	" ..	3	" ..	205	32	..	64
Centennial	" 8	115	60	" ..	3½	Medium	230	32	..	63¾
Fenton	" 1	108	58	" ..	2¾	Large ..	196	31	30	65½
Bright	" 10	117	62	" ..	3	Medium	265	31	20	63½
Arthur	" 4	111	42	" ..	3½	" ..	195	31	..	64½
Carleton	" 9	116	58	" ..	3¼	" ..	242	30	50	62¼
Bedford	" 9	116	62	" ..	3½	" ..	210	30	20	62
Canadian Beauty	" 3	110	70	" ..	4	Large ..	198	30	20	63½
Prussian Blue	" 5	112	74	" ..	3	Medium	205	30	..	63
Kent	" 9	116	60	" ..	3½	Large ..	196	30	..	61
Chancellor	" 10	117	62	" ..	4	Small ..	240	29	40	62½
Paragon	" 9	116	58	" ..	2½	Medium	220	29	20	61
Early Britain	July 30	106	70	" ..	2½	" ..	185	29	10	60½
Archer	Aug. 6	113	62	" ..	2½	" ..	240	29	10	65½
Bruce	" 10	117	58	" ..	3½	Large ..	200	28	40	62¾
Perth	" 6	113	60	" ..	3	" ..	235	28	..	62
White Marrowfat	" 8	115	52	" ..	3	" ..	260	28	..	63
Duke	" 8	115	52	" ..	3½	" ..	204	27	50	61¼
Mackay	" 8	115	58	" ..	3½	" ..	200	27	40	61¾
Trilby	" 8	115	56	" ..	3½	" ..	194	27	30	62½
French Canner	July 29	105	36	" ..	2½	Small ..	270	25	20	61½
Black-Eyed Marrowfat	Aug. 6	113	58	" ..	3½	Large ..	190	25	10	62¾
Prince	" 6	113	50	" ..	3	" ..	180	25	..	62¼
Nelson	" 4	111	72	" ..	3	Medium	165	23	20	62¼
Harrison's Glory	July 28	104	36	" ..	3	" ..	195	22	40	60

OATS—EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre.		Rusted.
				Ins.		Ins.		Lbs.	Bush.	Lbs.	
Banner No. 1.........	April 5.	Aug. 2.	119	50	Stiff ...	10–12	Branching	3,900	50	20	None.
" " 2.........	" 12.	" 4.	114	48	"	10–12	" ..	4,000	54	4	"
" " 3.........	" 19.	" 6.	109	50	" ...	10–12	" ..	4,000	61	6	"
" " 4.........	" 26.	" 8.	104	48	" ...	10–11	" ..	3,400	47	2	Slightly.
" " 5.........	May 3.	" 13.	102	52	" ...	10–12	" ..	4,040	62	12	Considerably.
" " 6.........	" 10.	" 15.	97	52	" ...	10–12	" ..	....	68	28	"
Abundance No. 1	April 5.	" 2.	119	46	" ...	10–11	" ..	3,800	47	2	None.
" " 2......	" 12.	" 4.	114	48	" ...	10–12	" ..	4,600	55	30	"
" " 3.. .	" 19.	" 6.	109	49	" ...	10–12	" ..	5,900	50	20	"
" " 4.. ...	" 26.	" 8.	104	48	" ...	10–12	" ..	5,700	47	19	Slightly.
" " 5.....	May 3.	" 13.	102	50	" ...	10–12	" ..	5,200	68	8	Considerably.
" " 6.....	" 10.	" 15.	97	50	" ...	10–12	" ..	5,000	76	16	"

Plots 5 and 6 in each case had been given a dressing with stable manure in autumn of 1897, because part of the surface soil had been removed in taking out large stumps, and this was thoroughly worked into the soil with drag and spading harrow before the seed was sown. This explains why the yield was so much larger on these plots. There was no smut on any of these oat plots.

BARLEY—EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre	Yield per Acre.	
				In.		In.		Lbs.	Bush.	Lbs.
Canadian Thorpe, No. 1..	April 5	Aug. 1	117	34	Stiff....... ..	2½	2-rowed...	2,400	20	..
" " 2..	" 12	" 3	112	34	"	2½	" ..	2,600	25	..
" " 3..	" 19	" 5	107	32	"	2½	" ..	2,600	25	20
" " 4..	" 26	" 8	103	30	"	2	" ..	2,400	21	32
" " 5..	May 3	" 10	97	30	"	3	" ..	2,800	20	..
" " 6..	" 10	" 13	94	30	"	3	" ..	3,200	21	32
Odessa, No. 1...........	April 5	July 28	114	36	Weak	2½	6-rowed...	2,600	25	..
" " 2....	" 12	" 30	109	36	"	2½	" ..	3,000	24	8
" " 3	" 19	Aug. 1	103	38	Medium	2½	" ..	2,400	20	20
" " 4...........	" 26	" 3	97	36	"	2½	" .	2,400	20	..
" " 5	May 3	" 5	92	36	Weak	2½	" ..	4,000	20	30
" " 6...........	" 10	" 6	86	34	"	2½	" ..	4,080	19	40

There was no rust or smut on any of these plots of barley.

SPRING WHEAT—EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight or Straw per acre.	Yield per Acre.	
				In.		In.		Lbs.	Bush.	Lbs.
Stanley, No. 1	April 5	Aug. 1	117	52	Stiff....... ..	3	Bald......	3,200	24	20
" " 2	" 12	" 4	113	48	"	3	"	3,200	23	..
" " 3...........	" 19	" 6	108	50	"	3	"	3,000	23	40
" " 4............	" 26	" 8	103	52	"	3	"	3,400	25	20
" " 5	May 3	" 13	102	48	"	2½	"	2,800	21	40
" " 6............	" 10	" 17	99	50	"	3	"	3,000	23	20
Red Fife, No. 1	April 5	" 4	120	50	"	3¼	"	3,900	24	20
" " 2..........	" 12	" 6	115	50	"	3	"	4,000	25	..
" " 3..........	" 19	" 8	110	50	"	3	"	... .	23	20
" " 4..........	" 26	" 13	108	48	"	3¼	"	3,400	22	20
" " 5....	May 3	" 17	105	48	"	3	"	3,600	20	40
" " 6..........	" 10	" 20	101	48	"	3	"	3,800	22	40

Plots 5 and 6 in both tests had been given a dressing of stable manure in fall of 1897. This had been thoroughly worked into the soil, and will account for the relatively heavy yield in those plots. There was no rust or smut on any of these plots.

PEASE—RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

The soil of these plots was a sandy loam, the previous crop was clover, which was a light crop on account of the inferior character of the soil. This was turned under in the autumn, and the land prepared for seed in the spring by disc-harrowing and harrowing with the smoothing-harrow. The size of the plots was one-twentieth acre each.

PEASE—EARLY, MEDIUM AND LATE SOWINGS.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Pod.	Size of Pea.	Weight of Straw per Acre	Yield per Acre.	
				In.		In.		Lbs.	Bush.	Lbs.
Mummy, No. 1...........	April 5	Aug. 6	122	56	Strong........	3	Medium..	5,500	42	20
" " 2...........	" 12	" 8	117	56	"	3	" ..	4,700	38	40
" " 3...........	" 19	" 10	112	54	"	3	" ..	5,800	37	20
" " 4..........	" 26	" 12	107	54	"	2½	" ..	5,400	30	40
" " 5...........	May 3	" 15	102	52	"	2½	" ..	5,480	30	20
" " 6...........	" 10	" 17	97	50	"	2½–3	" ..	5,520	30	40
Golden Vine, No. 1.......	April 5	" 6	122	60	Very strong...	3¼	" ..	5,700	42	40
" " 2......	" 12	" 8	124	56	" ..	3¼	" ..	5,700	38	40
" " 3.......	" 19	" 10	117	56	" ..	3	" ..	5,800	37	50
" " 4. ...	" 26	" 12	112	52	Strong.... ..	3	" ..	5,400	30	40
" " 5......	May 3	" 15	108	52	"	3	" ..	5,480	30	20
" " 6......	" 10	" 17	103	50	"	3	" ..	5,520	30	50

EXPERIMENTS WITH INDIAN CORN.

Twenty-five varieties of corn were tested. From the time the corn was planted until nearly the end of June the season was unfavourable for this crop, being cold and wet, and up to 1st July the corn had made very little growth. From that time forward until it was cut, the weather was more favourable and the growth was rapid, but the yields do not equal those of last year. The soil on which this corn was planted was sandy loam. The corn was grown in rows and hills 3 feet apart, and all the varieties were planted on the 17th May.

Indian Corn—Test of Varieties.

Name of Variety.	Height when cut.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	Ins.						Sept. 17th	Tons	Lbs.	Tons	Lbs.
Giant Prolific Sweet.	120 – 130	Very leafy	Aug. 18	Aug. 30	Sept. 23	....	Early milk	38	450	23	750
Red Cob Ensilage..	120 – 130	" ..	" 14	" 30	" 20	....	"	33	450	23	200
Early Mastodon	108 – 120	" ..	" 2	" 16	Aug. 27	Sept. 10	Glazed ...	29	1,400	24	1,500
Pride of the North..	108 – 120	" ..	" 18	" 30	Sept. 20	....	Early milk	29	80	21	1,780
Champion White Pearl	140 – 150	Medium..	" 20	Sept. 9	....	....	In silk....	28	1,760	21	420
Early Butler........	110 – 120	Very leafy	" 4	Aug. 16	Aug. 30	Sept. 14	Glazed ...	28	100	16	1,220
Cloud's Early Yellow	108 – 120	" ..	" 16	" 30	Sept. 17	....	Roasting .	26	1,460	18	1,950
Extra Early Huron Dent.	96 – 108	" ..	" 2	" 12	Aug. 29	Sept. 14	Glazed ...	25	1,920	16	340
White Cap Yellow Dent	120 – 130	Medium..	" 18	" 30	Sept. 23	....	Early milk	25	160	16	1,000
King of the Earliest.	120 – 130	" ..	" 9	" 22	" 4	Sept. 15	Glazed ...	22	1,610	15	1,570
Compton's Early....	108 – 120	Very leafy	" 4	" 20	" 7	" 23	Late milk.	22	1,500	15	800
Mammoth Eight-rowed Flint.	96 – 108	" ..	" 3	" 15	" 15	....	"	24	1,000	15	1,360
Pearce's Prolific.....	120 – 136	Medium..	" 11	" 22	" 8	" 18	Glazed ...	24	1,000	15	360
Thoroughbred White Flint.............	120 – 130	" ..	" 10	" 22	" 16	" 23	Late milk.	23	200	23	1,520
Ruby Mexican.....	84 – 90	" ..	" 12	" 25	" 23	....	Early milk	22	1,980	12	1,300
North Dakota White	100 – 110	" ..	" 6	" 16	" 2	" 14	Glazed. .	22	1,320	18	300
Sanford	108 – 120	" ..	" 13	" 29	" 20	....	Early milk	22	1,100	26	1,250
Selected Leaming...	140 – 150	" ..	" 8	" 19	" 10	....	"	22	220	17	1,970
Canadian White Flint.	84 120	" ..	" 16	" 25	" 12	Sept. 23	Late milk.	21	900	15	1,680
Angel of Midnight..	108 – 120	" ..	" 13	" 29	" 15	" 23	"	21	990	16	1,220
Mammoth Cuban....	110 – 120	" ..	" 6	" 16	" 2	" 23	"	20	1,800	18	960
Country Gentleman.	84 – 90	" ..	" 21	Sept. 23	....	....	Early milk	19	1,600	11	110
Longfellow..........	100 – 108	" ..	" 4	Aug. 15	" 2	" 12	Glazed ...	19	1,600	16	1,660
Mitchell's Extra Early	70 – 80	" ..	July 16	July 27	Aug. 8	Aug. 20	Ripe. ..	16	1,200	10	460
Evergeen Sugar.....	80 – 90	" ..	Aug. 13	Aug. 27	Sept. 22	....	Early milk	16	1,000	11	440

INDIAN CORN PLANTED AT DIFFERENT DISTANCES.

Three varieties of corn were chosen for this test and both were planted in drills or rows ranging at differences of six inches, from 2 feet up to 4.

The plants were thinned to six inches apart in the drill and to four plants in each hill and in each case the hills were the same distance apart each way.

Four rows were planted of each variety in each case, and the two centre rows were weighed for comparison.

It is worth noting that the corn was more matured and the stalks leafier in the drills and rows from 3½ feet and wider. All were planted on May 17 and cut for ensilage Sept. 23.

The yield per acre is reckoned from the product of 66 feet of the two centre rows:—

Name of Variety.	Distance Apart.	Weight in Drills.		Weight in Hills.	
	Feet.	Tons.	Lbs.	Tons.	Lbs.
Selected Leaming	2	33	330	25	1,975
"	2½	29	1,400	24	1,896
"	3	22	550	21	20
"	3½	19	440	16	1,943
"	4	18	1,025	14	1,535
Longfellow	2	22	550	24	1,500
"	2½	20	1,976	23	1,520
"	3	21	1,920	18	....
"	3½	22	314	17	320
"	4	21	147	12	1,410
Champion White Pearl	2	15	1,700	23	800
" "	2½	16	208	20	128
" "	3	23	1,850	21	900
" "	3½	26	314	19	1,600
" "	4	19	610	18	1,620

EXPERIMENTS WITH TURNIPS.

Eighteen varieties of turnips were tested this year and two sowings were made in each case. The land used for this test was a clay loam which has been cropped for a number of years and is uniform in character, and the seed having been all sown on the same day and all subsequent treatment the same, the test may be considered a fair one, as between varieties. The yield per acre has been calculated from the weight of roots obtained from two rows each 66 feet long.

Turnips—Test of Varieties.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Purple Top Swede	May 9.	May 23.	Oct. 19.	Oct. 19.	58	1,040	1,950	40	56	112	1,868	32
Jumbo	" 9.	" 23.	" 19.	" 19.	58	336	1,938	56	40	1,312	1,355	12
Giant King	" 9.	" 23.	" 19.	" 19.	49	624	1,643	44	32	120	1,068	40
Bangholm Selected	" 9.	" 23.	" 19.	" 19.	47	864	1,581	4	31	1,240	1,054	..
Sutton's Champion	" 9.	" 23.	" 19.	" 19.	40	1,400	1,356	40	38	1,440	1,290	40
Skirving's	" 9.	" 23.	" 19.	" 19.	40	1,312	1,355	12	35	752	1,179	12
Halewood's Bronze Top	" 9.	" 23.	" 19.	" 19.	43	1,120	1,452	..	28	144	935	44
Hall's Westbury	" 9.	" 23.	" 19.	" 19.	43	1,032	1,450	42	28	144	935	44
Prize Winner	" 9.	" 23.	" 19.	" 19.	35	664	1,177	44	34	992	1,149	52
East Lothian	" 9.	" 23.	" 19.	" 19.	43	1,384	1,456	24	25	952	849	12
Drummond Purple Top	" 9.	" 23.	" 19.	" 19.	35	576	1,176	16	33	..	1,100	..
Shamrock Purple Top	" 9.	" 23.	" 19.	" 19.	30	1,424	1,023	44	29	1,840	997	20
Hartley's Bronze	" 9.	" 23.	" 19.	" 19.	30	1,600	1,026	40	29	80	968	..
Prize Purple Top	" 9.	" 23.	" 19.	" 19.	30	1,952	1,032	32	27	1,440	924	..
Marquis of Lorne	" 9.	" 23.	" 19.	" 19.	29	784	978	4	29	168	969	28
Champion Purple Top	" 9.	" 23.	" 19.	" 19.	29	256	970	56	28	1,904	965	4
Carter's Elephant	" 9.	" 23.	" 19.	" 19.	29	960	982	40	28	320	938	40
Mammoth Clyde	" 9.	" 23.	" 19.	" 19.	26	800	880	..	25	1,568	859	28

EXPERIMENTS WITH MANGELS.

Sixteen varieties of mangels were tested and two sowings of each were made. The land was a clay loam and the previous crop was small fruits. The spring during seeding time was rather unfavorable and the seed did not germinate well, and in consequence the stand was uneven and the yield considerably lessened, but, as in previous years, the early sown seed gives the best returns.

MANGELS.—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.—1st Plot. Tons.	Lbs.	Yield per Acre.—1st Plot. Bush.	Lbs.	Yield per Acre.—2nd Plot. Tons.	Lbs.	Yield per Acre.—2nd Plot. Bush.	Lbs.
Selected Mam. Long Red	April 28	May 12	Oct. 19	Oct. 19	35	1,456	1,190	56	35	48	1,167	28
Red Fleshed Globe......	" 28	" 12	" 19	" 19	35	928	1,182	8	35	576	1,176	16
Gate Post	" 28	" 12	" 19	" 19	35	400	1,173	20	34	464	1,141	4
Mammoth Long Red	" 28	" 12	" 19	" 19	33	880	1,114	40	32	1,120	1,085	20
Giant Yellow Intermediate	" 28	" 12	" 19	" 19	30	1,776	1,029	36	29	1,400	990	..
Warden Orange Globe...	" 28	" 12	" 19	" 19	30	1,424	1,023	44	29	80	968	..
Canadian Giant	" 28	" 12	" 19	" 19	29	1,840	997	20	29	872	981	12
Prize Mam. Long Red...	" 28	" 12	" 19	" 19	26	976	882	56	24	1,280	821	20
Champion Yellow Globe.	" 28	" 12	" 19	" 19	24	1,984	833	4	24	752	812	32
Golden Fleshed Tankard.	" 28	" 12	" 19	" 19	24	1,280	821	20	22	264	736	4
Norbiton Giant..........	" 28	" 12	" 19	" 19	24	400	806	40	22	1,760	762	40
Giant Yellow Half Long.	" 28	" 12	" 19	" 19	22	1,056	750	56	22	264	736	4
Yellow Gate Post.	" 28	" 12	" 19	" 19	21	1,120	718	40	20	40	667	40
Ward's Large Oval Shaped	" 28	" 12	" 19	" 19	21	64	701	4	17	1,200	586	40
Red Fleshed Tankard....	" 28	" 12	" 19	" 19	17	1,960	599	20	14	1,832	497	12
Giant Yellow Globe......	" 28	" 12	" 19	" 19	17	1,200	586	40	14	1,040	484	..

EXPERIMENTS WITH CARROTS.

Eighteen varieties of carrots were tested this year. Two sowings of each were made, the first on 28th April and the second on 12th May. The soil was a sandy loam in good condition and fairly uniform in character. One or two varieties suffered somewhat from having been sown on spots where fir stumps had been, and the soil was not as good. The yield per acre has been calculated from two rows each 66 feet long.

CARROTS.—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre.—1st Plot. Tons.	Lbs.	Yield per Acre.—1st Plot. Bush.	Lbs.	Yield per Acre.—2nd Plot. Tons.	Lbs.	Yield per Acre.—2nd Plot. Bush.	Lbs.
Improved Short White...	April 28	May 12	Oct. 19	Oct. 19	32	826	1,080	26	42	333	1,405	33
White Belgian	" 28	" 12	" 19	" 19	36	1,626	1,227	46	35	986	1,183	16
Half Long White.......	" 28	" 12	" 19	" 19	37	214	1,236	54	32	972	1,082	52
Mam. White Intermediate	" 28	" 12	" 19	" 19	34	630	1,143	50	32	1,696	1,094	56
Yellow Intermediate	" 28	" 12	" 19	" 19	35	1,720	1,195	20	29	1,986	999	46
Green Top White Orthe..	" 28	" 12	" 19	" 19	32	826	1,080	26	29	666	977	46
Half Long Chantenay....	" 28	" 12	" 19	" 19	32	1,266	1,087	46	24	400	806	40
Ontario Champion.......	" 28	" 12	" 19	" 19	28	1,200	953	20	27	1,000	916	40
Guerande or Ox Heart...	" 28	" 12	" 19	" 19	27	853	914	13	27	256	904	16
Early Gem............	" 28	" 12	" 19	" 19	25	1,333	855	33	24	1,133	818	53
Iverson's Champion.	" 28	" 12	" 19	" 19	25	1,726	862	6	24	693	811	33
Giant White Vosges.....	" 28	" 12	" 19	" 19	25	1,333	855	33	22	..	733	20
Scarlet Intermediate.....	" 28	" 12	" 19	" 19	24	400	806	40	15	1,000	516	00
Long Scarlet Altringham.	" 28	" 12	" 19	" 19	20	1,946	699	6	16	560	542	40
Carter's Orange Giant....	" 28	" 12	" 19	" 19	20	153	669	13	14	1,626	493	46
Long Orange or Surrey..	" 28	" 12	" 19	" 19	12	1,666	427	46	15	1,083	518	3

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were tested. The land was a clay loam, one of the oldest worked pieces on the farm and was fairly uniform in character and moderately rich. The yields per acre were satisfactory. These have been calculated from the weight of roots gathered from two rows each 66 feet long.

SUGAR BEETS.—TEST OF VARIETIES.

Name of Variety.	1st Plot Sown.	2nd Plot Sown.	1st Plot Pulled.	2nd Plot Pulled.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
					Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Red Top Sugar..........	May 9..	May 23.	Oct. 19.	Oct. 19.	35	1,456	1,190	56	30	928	1,015	28
Danish Red Top.........	" ..	" .	" .	" .	35	576	1,176	16	27	384	906	24
Improved Imperial......	" ..	" .	" .	" .	30	192	1,003	12	29	1,664	994	24
Vilmorin's Improved....	" ..	" .	" .	" .	29	432	973	52	27	1,440	924	00
Danish Improved.... ...	" ..	" .	" .	" .	26	1,064	884	24	20	656	677	36
Wanzleben.............	" ..	" .	" .	" .	21	1,912	731	52	21	1,560	726	00

EXPERIMENTS WITH POTATOES.

One hundred and eleven varieties of potatoes were tested this year. The soil was a strong clay loam, and had been in pease last year, which was the first crop since two or three large fir stumps had been taken out of this area, it was scarcely uniform in quality, and this reduced the yield of those potatoes which happened to be planted in such spots.

The yield on the whole, however, was very fair, the quality excellent and the percentage of rotten tubers was very small. The marketable average is fairly high. All were planted on 13th May.

POTATOES.—TEST OF VARIETIES.

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Hayden's Seedling...........	Oct. 3	733	20	733	20	None	...	693	..	40	20	Long purple.
Topas White........ -	" 3	652	40	652	40	"	...	620	40	32	..	" white.
Dakota Red	" 3	623	20	623	20	"	...	561	..	62	20	" red.
New Variety No. 1..........	" 3	616	..	616	..	"	...	554	24	61	36	Oblong rose.
Uncle Sam..................	Sept. 26	586	40	586	40	"	...	528	10	58	30	" white.
American Giant.............	Oct. 3	586	40	586	40	"	...	524	..	62	40	Long "
Rural Blush.................	" 27	583	24	583	24	"	...	495	51	87	33	" red.
Houlton Rose....	" 27	583	24	583	24	"	...	494	30	88	54	" rose.
Charles Downing............	" 26	580	48	580	48	"	...	435	38	145	10	Oblong white.
Maggie Murphy	" 1	572	..	572	..	"	...	524	30	57	30	Long flat white.
Troy Seedling...............	" 3	572	..	572	..	"	...	523	..	59	..	" red.
Early Norther.........	" 27	564	40	564	40	"	...	452	40	112	..	" pink and white.
Dreer's Standard......	" 1	557	20	557	20	"	...	490	30	66	50	" rose.
Foreman's Early...	" 1	550	..	550	..	"	...	496	..	54	..	" white.
American Wonder...........	" 1	550	..	513	30	27	30	461	50	51	40	" "
Ideal....................... ...	" 1	548	30	548	30	None	...	466	15	82	15	" red.
Daisy.......................	Sept. 26	542	40	542	40	"	...	434	10	108	30	" rose.

POTATOES.—TEST OF VARIETIES—*Continued.*

Name of Variety.	Dug.	Total Yield per Acre. Bush.	Lbs.	Yield per Acre of Sound. Bush.	Lbs.	Yield per Acre of Rotten. Bush.	Lbs.	Yield per Acre of Marketable. Bush.	Lbs.	Yield per Acre of Unmarketable. Bush.	Lbs.	Form and Colour.
Seedling No. 7	Oct. 1	542	40	542	40	None	...	433	50	108	50	Long red.
Bill Nye	Sept. 26	532	24	532	24	"	...	425	54	106	30	" white.
Sir Walter Raleigh	" 27	532	24	532	24	"	...	479	24	53	..	Oval "
Holborn Abundance	" 27	532	24	452	54	79	30	336	20	116	34	Round "
Sharpe's Seedling	Oct. 1	528	..	528	..	None	...	475	40	52	20	Long rose.
General Gordon	Sept. 19	528	..	514	..	12	..	488	40	26	20	" pink.
Seedling No. 230	" 19	528	..	528	..	None	...	474	20	53	40	Round white.
Clay Rose	" 26	513	20	513	20	"	...	461	40	51	30	Long rose.
Brownell's Winner	" 27	513	..	463	..	50	..	347	10	115	50	" red.
Northern Spy	" 26	491	20	491	20	None	...	417	36	73	42	" "
Crown Jewel	" 26	491	20	491	20	"	...	441	20	50	..	" pale rose.
Reeve's Rose	" 26	486	56	438	26	48	30	340	..	98	26	" rose.
Money Maker	" 26	484	..	484	..	None	...	363	..	121	..	" white.
Irish Daisy	" 26	484	..	484	..	"	...	387	20	96	40	" "
Vick's Extra Early	Oct. 1	484	..	484	..	"	...	435	..	49	..	" rose.
Peerless Junior	" 26	484	..	484	..	"	...	433	..	51	..	Oval white.
Lizzie's Pride	" 3	476	40	476	40	"	...	405	10	71	30	Long pink.
Empire State	" 1	476	40	476	40	"	...	426	10	50	30	" white.
Record	" 1	476	40	453	..	23	40	317	30	135	30	" "
Beauty of Hebron	Sept. 26	476	40	466	..	10	40	421	..	45	..	" pale rose.
Early Sunrise	" 26	475	12	475	12	None	...	404	..	71	12	" rose.
Green Mountain	" 26	475	..	475	..	"	...	425	30	49	30	Oval white.
Monroe County	" 26	466	24	466	24	"	...	396	44	69	40	Long red.
Early Rose	Oct. 1	464	56	395	26	69	30	299	41	95	45	" rose.
Reading Giant	" 1	463	28	463	28	None	...	417	28	46	..	Oblong pink.
London	" 3	462	..	462	..	"	...	415	..	47	..	Long rose.
Clarke's No. 1	" 3	462	..	462	..	"	...	414	..	48	..	" pale rose.
Queen of the Valley	" 1	457	36	457	36	"	...	366	36	91	..	" rose.
Early White Prize	" 3	454	40	454	40	"	...	386	40	68	..	" white.
Rose No. 9	Sept. 26	454	40	454	40	"	...	364	..	90	40	" red.
Abundance	" 26	448	48	448	48	"	...	405	..	43	48	Round white.
Earliest of All	Oct. 1	447	20	447	20	"	...	380	20	67	..	Long rose.
McKenzie	Sept. 27	447	20	447	20	"	...	358	50	88	30	" white.
Pride of the Market	Oct. 1	445	50	445	50	"	...	358	50	87	..	" "
Bovee	Sept. 19	445	52	445	52	"	...	398	22	47	30	" rose.
Wonder of the World	" 19	445	..	445	..	"	...	378	14	66	46	" "
Everett	" 19	444	20	444	20	"	...	400	50	43	30	Round white.
Burpee's Extra Early	" 26	444	20	444	20	"	...	382	20	62	..	Long pale rose.
Carman No. 3	" 26	443	30	443	30	"	...	418	30	25	..	Oval white.
Rural No. 2	" 26	443	..	443	..	"	...	432	..	11	..	" "
State of Maine	" 27	443	..	443	..	"	...	398	..	45	..	Long white.
Lightning Express	Oct. 1	441	28	441	28	"	...	395	28	46	..	" pale red.
Maule's Thoroughbred	" 1	441	28	441	28	"	...	350	28	91	..	" rose.
White Beauty	" 3	440	..	440	..	"	...	396	..	44	..	" white.
Early Fortune	" 3	440	..	440	..	"	...	393	30	46	30	" rose.
Pearce's Prize Winner	" 1	438	32	438	32	"	...	329	..	109	32	" pink.
Ohio Junior	Sept. 26	436	6	436	6	"	...	370	42	65	24	" red.
Stourbridge Glory	Oct. 3	431	42	431	42	"	...	363	27	67	15	" white.
Pearce's Extra Early	Sept. 19	431	42	431	42	"	...	388	..	43	42	" pale rose.
Late Puritan	" 19	428	46	428	46	"	...	375	18	42	28	" white.
Brown's Rot Proof	" 19	425	50	425	50	"	..	404	20	21	30	" red.
Chicago Market	" 26	415	50	425	50	"	...	402	20	23	30	" red.
Early Gem	Oct. 1	410	40	410	40	"	...	369	10	41	30	" pale rose.
Burnaby Seedling	" 1	409	12	409	12	"	...	367	12	42	..	" "
Lee's Favourite	" 3	407	44	407	44	"	...	367	14	40	30	" rose.
New Queen	" 3	406	14	406	14	"	...	365	..	41	14	" "
Flemish Beauty	" 3	406	14	394	10	12	14	359	20	39	40	" "
Seedling No. 214	Sept. 19	401	50	401	50	None	...	361	20	40	30	Round white.
Early Six Weeks	Oct. 1	395	46	395	46	"	...	355	26	40	20	"
Early Puritan	" 1	395	40	395	40	....		336	10	59	30	Oblong rose.
Cambridge Russet	" 3	395	40	376	..	19	40	297	..	79	..	Long white.
I X L	Sept. 26	394	12	394	12	None	...	355	2	39	10	" russet white.
Orphans	" 26	388	40	388	40	"	...	291	30	97	10	" pink.

POTATOES—TEST OF VARIETIES.—*Concluded.*

Name of Variety.	Dug.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Thorburn	Sept. 26	387	12	387	12	None	...	309	56	77	16	Long white.
Pride of the Table	" 27	385	44	385	44	"	...	308	24	77	20	" red.
Irish Cobbler	" 27	381	20	381	20	"	...	247	52	133	28	Oval white.
Rochester Rose	" 19	378	24	378	24	"	...	339	24	39	..	Long red.
Great Divide	" 26	375	28	375	28	"	...	300	28	75	..	" white.
Honeoye Rose	" 19	371	4	371	4	"	...	352	24	18	40	Oblong rose.
Early Ohio	" 26	369	36	369	36	"	...	351	6	18	30	Long rose.
Columbus	" 26	368	8	368	8	"	...	331	40	36	28	" pale rose.
Satisfaction	Oct. 1	366	40	366	40	"	...	293	40	73	..	" white.
Quaker City	" 1	366	40	330	..	36	40	231	..	99	..	" "
Victor Rose	" 3	365	12	365	12	None	...	328	22	36	50	" rose.
Delaware	" 3	363	44	363	44	"	...	325	44	38	..	Oblong white.
Soudan	" 3	359	20	359	20	"	...	269	40	89	40	Round russet.
Ash Leaf Kidney	Sept. 19	352	..	352	..	"	...	313	30	38	30	Long white.
Algoma No. 1	" 19	350	32	350	32	"	...	314	52	35	40	" pink.
Russell's Seedling	Oct. 3	344	40	344	40	"	...	275	44	68	56	Oval white.
Harbinger	Sept. 27	337	20	337	20	"	...	268	52	67	28	Long pink.
Good News	" 26	325	36	325	36	"	...	260	16	65	20	" rose.
Early Harvest	" 26	322	40	322	40	"	...	273	16	48	24	" white.
Freeman's	" 26	319	44	319	44	"	...	185	11	134	33	Oblong white.
Hopeful	" 26	315	20	315	20	"	...	252	20	63	..	Long white.
World's Fair	" 26	313	50	313	50	"	...	248	50	65	..	Oblong white.
Prize Taker	Oct. 1	310	56	279	36	31	20	221	..	58	36	" red.
Carman No. 1	Sept. 26	309	28	309	28	None	...	232	16	77	12	" white.
Polaris	" 26	308	..	308	..	"	...	248	..	60	..	Long "
Vanier	Oct. 1	308	..	308	..	"	...	277	20	30	40	" red.
Hale's Champion	Sept. 26	300	40	270	40	30	..	169	40	108	..	Round white.
Seattle	" 27	296	16	296	16	None	...	207	24	88	52	Long "
Table King	" 26	293	10	293	10	"	...	231	40	61	30	" "
King of the Roses	" 27	290	24	275	24	15	..	206	24	69	..	" rose.
Fillbasket	Oct. 1	256	40	256	40	None	...	204	50	21	50	" red.

SUMMARY OF HAY AND FORAGE CROPS HARVESTED.

	Tons.	Cwt.
Clover hay cured	55	15
Clover put into silo	28	0
Corn " "	34	4
Turnips	32	0
Mangels	7	15
Carrots	13	0
Sugar beets	2	5

A considerable quantity of clover, both first and second crop, was cut and fed green to the horses and cattle.

EXPERIMENTS WITH FODDER CROPS.

Fodder corn was cut and fed green from 1st of October until last of December, the silo not being large enough to hold it all, owing to the quantity of clover put into it.

The following mixtures of grain were sown to be cut green for fodder purposes. The soil was a sandy loam. The size of the plots was one-twentieth acre each.

Name of Variety.	Date of Sowing.	Date of Cutting.	Yield. — Weight when cut.		Yield. — Weight when cured.		Remarks.
			Tons.	Lbs.	Tons.	Lbs.	
Mixture No. 1 (sown with one bushel each of pease, barley and oats)	May 2..	July 18..	9	60	4	430	Cut when oats were in late milk.
Mixture No. 2 (sown with one bushel each of pease, wheat and oats)	" 2..	" 18..	8	1,760	3	1,380	" "

These mixtures continue to give good satisfaction, and where hay land is short provide a first class substitute.

EXPERIMENTS WITH JAPANESE MILLET, SOJA BEANS AND HORSE BEANS.

JAPANESE MILLET.

The seed of this millet, also the seed used in the two following tests of Soja Beans and Horse Beans, was received early in the season from the Director with instructions for sowing. The chief object in view in these experiments was to gain information as to the relative usefulness of these plants as forage crops in this climate and the weight of the crop obtainable from each when sown in different ways.

The land on which the Japanese Millet, Soja Beans and Horse Beans, were sown was a warm sandy loam which had received a dressing of stable manure in the winter of 1896. Where the seed was sown in drills the soil was kept clean and mellow with the cultivator. The season during midsummer being very hot and dry, the cultivation was very advantageous to the plants sown in drills.

The size of the plots was one-twentieth acre each.

Five test plots of the Japanese Millet were sown on 27th April, four of them in drills at different distances apart and one broadcast. They were all cut on the 10th September.

The growth was strong and the stalks leafy, with heads ranging from 2½ to 7 inches in length.

As will be seen by the records the wide drills gave the heaviest yields, the growth in every respect being greater, but where the stalks grow so stout and woody unless the fodder was run through an ensilage cutter there would be considerable waste in feeding. Horses and cattle eat it readily, either freshly cut or cured as hay.

JAPANESE MILLET.

Name of Variety.	Length of Straw.	Character of Straw.	Length of Head.	Yield per acre. — Green.		Cured. — Yield per acre.		Remarks.
	Inches.		Inches.	Tons.	Lbs.	Tons.	Lbs.	
Plot 1, drills 9 inches apart	52—54	Very leafy	5—6	12	600	6	400	Cut when seed was in late milk.
" 2 " 12 "	52—54	"	5—6	12	1,200	6	900	" "
" 3 " 15 "	56—60	"	5—6	14		7	300	Stalks very stout.
" 4 " 18 "	58—62	"	5—7	16	800	8	700	"
" 5 broadcast	36—48	"	2—6	7	1,000	3	1,500	Stalks slender and short.

SOJA BEANS.

These were sown in drills at different distances apart. The growth was from 35 to 40 inches high, and the plants branched so freely and had so many leaves that by midsummer the drills were not apparent. The branches were well loaded with pods containing from two to four beans each. This crop requires a longer season to ripen the bean, but it makes a fine fodder for green feed, the cattle and horses preferring it to any other food. All of it was fed green as our silo was full and the weather was unfavourable for curing it.

SOJA BEANS.

Name of Variety.	Date of Sowing.	Date of Cutting.	Length of Straw.	Yield per acre.	Remarks.
			Inches.	Tons. Lbs.	
Plot 1, drills 2 feet apart	April 27..	Oct. 5.	30—40	6 800	Cut when beans were in a soft green state.
" 2 " 2½ "	" 27..	" 5..	35—40	5 1,800	" "
" 3 " 3 "	" 27..	" 5..	35—40	5 800	" "

HORSE BEANS.

Three plots of these beans were sown. The seed did not germinate well, and the stand was in consequence uneven and poor. The plants grew from 30 to 34 inches high and were fairly well podded, but the pods were short, averaging about three beans each. When cut some of the lower pods were ripe and the beans beginning to shell. Cut 19th September, and mixed with corn and put into silo or fed green.

Nomber of Plot.	Date of Sowing.	Date of Cutting.	Height of Plant.	Yield per acre.	Remarks.
			Inches.	Tons. Lbs.	
Plot 1, drills 2 feet apart	April 27..	Sept. 19..	30—34	3 600	Cut when lower pods were ripe.
" 2 " 2½ "	" 27..	" 19..	30—40	2 900	" "
" 3 " 3 "	" 27..	" 19..	30—40	2 300	" "

EXPERIMENTS WITH CLOVER SEED INOCULATED WITH NITRAGIN AND WITHOUT NITRAGIN.

The soil for these tests was a clay loam that had been used as a nursery for some years, but which had received no manure since 1892, when it was given a light dressing of stable manure. This land was ploughed early in the spring of 1898 and sown with a mixture of pease and oats which had made a fair growth, when turned under for the clover tests. Four plots of one-twentieth of an acre each were laid out, and two of these sown with the clover seed which had been treated, one at the rate of 10 pounds per acre, and the other at the rate of 7 pounds per acre. The other two plots were sown

View on the Experimental Farm at Agassiz, British Columbia, showing part of Arboretum and residence of Superintendent.

with untreated seed at the same rate. The heaviest seeding gave the thickest stand, but apart from that there seemed to be no perceptible difference in the growth at the end of the season.

POULTRY.

There are four breeds of poultry on the farm—Light Brahmas, White Wyandottes, Black Minorcas, and White Leghorns. These fowls have a comfortable house, and, excepting those which are kept in breeding pens, are allowed to run at large and are regularly fed and cared for. They were not forced in any way either for laying or fattening.

The Black Minorcas are the best layers, and their eggs are large.

The Light Brahmas are the best for the table and second as layers. A pair of Brahma cockerels weighed 9¼ pounds at four months old.

The White Wyandottes are very nearly equal to the Light Brahmas as broilers. A pair of White Wyandotte cockerels weighed 8 pounds 3 ounces at four months old; they have not been as good layers here as the Light Brahmas.

The White Leghorns are good layers, but their eggs are small and their bodies so small that they are of little value for the table.

LARGE FRUITS.

APPLES.

This has been an off year for apples in old orchards or where trees have been bearing continuously for several years. Of winter apples, Salome, Scotts Winter, Baldwin, Ben Davis and Sutton Beauty were the only varieties amongst the old trees that bore a fairly good crop.

In the newer plantations and on the benches the crop has been a fairly good one. The forest tent caterpillar was very plentiful, and where orchards were not promptly sprayed they did considerable damage. A large number of the Russian varieties of apples fruited this year. The trees in almost every case are strong growers and early bearers, but nearly all of them are summer or early autumn apples. The trees on the benches have made a very satisfactory growth, and many of them had some fruit, but unfortunately a good deal of this was destroyed by bears which were very numerous this year, four having been shot in our orchards and others seen.

The following extracts are from notes taken, describing some of the best of those varieties which fruited for the first time this year:—

Red Juneating.—Tree a moderate grower and fairly productive. Fruit small to medium in size, conical. Skin greenish yellow, nearly covered with red. Flesh white, crisp, and juicy, acid. Ripe last of July.

Arkad Solovieff.—Tree a strong, vigorous grower. Fruit above medium size of an irregular, conical shape. Skin waxen yellow. Flesh white, juicy, nearly sweet, perfumed. Ripe last of July.

Skrosnina Grell.—Tree vigorous and productive. Fruit of medium size, roundish flat. Skin yellow with a bronze cheek. Flesh white, crisp, juicy, mild sub acid. Season, last of July.

Rosy Voronesh, 1277.—Tree a vigorous grower. Fruit above medium size, oblong conical. Skin yellow streaked and splashed with red. Flesh white, crisp, juicy, pleasant, a little coarse. Season, early August.

Rosy Repka.—Tree vigorous and productive. Fruit above medium size, conical. Skin green, striped and splashed with red and with a whitish bloom. Flesh coarse, juicy, sprightly, flavour good. Season, August.

Pewaukee Russet.—Tree a very vigorous grower, Fruit flattish, conical. Skin russet green, nearly covered with splashes of red in two shades. Flesh white, juicy, coarse, a pleasant, mild, acid. Season, August.

White Cardinal.—Tree a moderate grower, productive. Fruit large, flattish, tapering to the eye. Skin of a clear yellow colour. Flesh coarse, crisp, mildly acid. Season, August.

Newton.—Tree a vigorous grower. Fruit of medium size, slightly conical. Skin green, nearly covered with red. Flesh white, crisp, acid. Season, August.

Excelsior.—Tree a strong, vigorous grower and productive. Fruit of medium size, nearly globular. Skin yellow with a bright red cheek. Flesh crisp, juicy, white, mildly acid and pleasant. Season, August.

Repolovka 1 M.—Tree a vigorous grower. Fruit of medium size, globular. Skin white with a reddish cheek. Flesh white, juicy, firm and of a brisk acid. Season, August.

Golden Reinette.—Tree vigorous and productive. Fruit round, flat and of medium size. Flesh white, coarse, juicy, a mild acid. Season, August.

Koursk Anis.—Tree a strong grower. Fruit of medium size, flat. Skin green, nearly covered with dark purple. Flesh white, juicy and pleasantly acid. Season, August.

Arabka.—Tree a vigorous grower. Fruit of medium size, oblong conical. Skin green, nearly covered with dull red. Flesh white, moderately juicy, sweet, pleasant. Season, August.

Flat Voronesh.—Tree a vigorous grower and productive. Fruit very similar to the Duchess, but considerably larger. Season, August.

William's Favourite.—Tree a vigorous grower. Fruit above medium in size, conical. Skin green, splashed and streaked with pale and dark red. Flesh white, crisp, pleasant and mildly acid. Season, August.

Ruby Gem.—Tree a moderate grower. Fruit of medium size, globular. Skin green, nearly covered with dull red and sprinkled with small white dots. Flesh white, fine, crisp, juicy, of a mild and pleasant acid. Season, August.

Porter.—Tree vigorous and productive. Fruit above medium size, oblong, yellow. Flesh white, tender and of fine flavour. Season, August.

Kara Synap A.—Tree a strong and vigorous grower. Fruit of medium size, flat, conical. Skin green, freely splashed with red. Flesh yellowish, crisp, juicy, rather coarse but pleasant. Season, August.

Paperovka.—Tree vigorous. Fruit above medium size, conical. Skin yellowish white. Flesh white, dry, coarse and granular. Season, August.

Gracie.—Tree vigorous and productive. Fruit large, flattish, conical. Skin whitish green. Flesh white, coarse and mildly acid. Season, August.

Blushed Calville.—Tree a vigorous grower. Fruit above medium in size, flattish Skin yellow. Flesh tender, white, juicy, pleasant. Season, August.

Red Streak.—Tree a vigorous grower. Fruit large, similar in appearance and quality to Alexander, but earlier. Season, August.

Persian Bogdanoff.—Tree a vigorous grower. Fruit of medium size, oblong, conical. Skin green, nearly covered with dull red. Flesh white, moderately juicy, sweet and pleasant. Season, August.

Pointed Pipka.—Tree a vigorous grower. Fruit above medium in size, oblong, conical. Skin whitish yellow, nearly covered with streaks and splashes of bright red. Flesh coarse, juicy, crisp and mildly acid. Season, August.

Little Hat.—Tree a vigorous grower. Fruit large, oblong conical. Skin green, splashed and striped with bright red. Flesh yellow, a little soft, juicy, acid. Season, August.

Anisovka.—Tree a vigorous grower and productive. Fruit very similar to Duchess in quality and season, but larger. Season, August.

Orel.—Tree a vigorous grower. Fruit of the Alexander type, large, handsome, and a good cooking apple. Season, August.

Avenarius.—Tree a vigorous grower. Fruit of medium size, nearly round. Skin yellowish green, nearly covered with streaks and spots of light red. Flesh white, not juicy, mildly acid. Season, August.

Headly.—Tree a vigorous grower and productive. Fruit very similar to Duchess, but nearly a month later. Season, last of August and first of September.

Green Stripe.—Tree a strong grower. Fruit large, oblong, conical. Skin greenish white, with red stripes and sprinkled with white dots. Flesh white, firm, juicy and pleasantly acid. Season, August.

Mank's Codlin.—Tree an early and free bearer. Fruit of medium size, oblong, conical. Skin yellow, with a warm blush on the sunny side. Flesh yellowish white, crisp, juicy, and pleasantly acid. Season, August and September.

Deane's Codlin.—Tree a vigorous grower and productive. Fruit large, oblong, slightly conical. Skin yellow. Flesh white, juicy, and of a pleasant character. Season, August and September.

Grandmother.—Tree a vigorous grower. Fruit above medium in size, flattish, conical. Skin greenish white, streaked and splashed with light red. Flesh rather dry, granular and sweet. Season, autumn.

Baraboo.—Tree a vigorous grower. Fruit of medium size, flat. Skin russet white, with a light blush on the sunny side. Flesh white, juicy, acid. Season, autumn.

Rambour Reinette.—Tree a vigorous grower. Fruit large, irregular, ribbed, conical. Skin yellow, with a little red on the sunny side. Flesh white, coarse, juicy, acid. Season, autumn.

Summer Spice.—Tree a vigorous grower and an early bearer. Fruit of medium size, oblong, tapering to the eye. Skin yellow. Flesh white, not juicy, but mildly acid, pleasant. Season, autumn.

Quaker Beauty.—Tree a vigorous grower. Fruit above medium size, flattish, conical. Skin russet green, with a warm blush. Flesh white, not juicy, but mildly acid. Season, autumn.

Russian Preserve.—Tree a vigorous grower and productive. Fruit of medium size, round and flattened. Skin greenish white. Flesh dry, tough, white, sweet, and of poor flavour. Season, September.

Long Arcade.—Tree a vigorous grower. Fruit large, irregular, conical. Skin green, nearly covered with red, and with many small white dots. Flesh white, juicy and pleasant. Season, September.

Early Ripe.—Tree a moderate grower. Fruit above medium size, oblate. Skin green, with a bronze red cheek. Flesh white, crisp, juicy, mildly acid and pleasant. Season, autumn.

Lowell.—Tree a vigorous grower and productive. Fruit large, oblong. Skin yellow, oily. Flesh yellowish white, crisp, tender and of fine flavour. Season, September and October.

Borsdorf.—Tree a vigorous grower and productive. Fruit above medium size, oblong, tapering to the eye. Skin green, streaked with dull red. Flesh white, mildly acid and juicy. Season, September.

Western Beauty.—Tree a vigorous and spreading grower. Fruit large, flattish, globular. Skin greenish white, with splashes and dots of red. Flesh white, mildly acid, juicy, crisp and pleasant. Season, September.

Day.—Tree a vigorous grower. Fruit large, oblate. Skin green, with numerous small whitish dots and a little red on the sunny side. Flesh, yellowish white, crisp, juicy and pleasant. Season, September.

Flora Belle.—Tree a vigorous grower and productive. Fruit large, oblong, conical. Skin rich yellow, with small patches of russet and small dots. Flesh yellowish, tender, crisp, subacid, pleasant. Season, autumn.

Fall Wine.—Tree a moderate grower. Fruit large, conical. Skin green, with a small dull red cheek and sprinkled with whitish dots. Flesh yellowish, juicy, tender, mildly acid, and of fine flavour. Season, autumn.

Gremuck.—Tree a very vigorous grower. Fruit very large, conical. Skin green, with a few stripes of red. Flesh white, coarse, acid; quality poor. Season, autumn.

Royal Table.—Tree a vigorous grower and productive. Fruit of medium size, globular. Skin green, with a blush and sprinkled with white dots. Flesh white, crisp, juicy and of a pleasant flavour. Season, October and November.

Mother.—Tree a vigorous grower and productive. Fruit above medium size, oblong, tapering a little. Skin green and nearly covered with bright red and many small white dots. Flesh yellowish white, crisp, tender, juicy, a mild subacid; quality very good. Season, October and November.

Haskell's Sweet.—Tree a moderate grower. Fruit above medium size, oblate. Skin green, with a dull blush. Flesh yellowish white, fine-grained, tender, juicy and sweet. Season, autumn.

Simbirsk No. 11.—Tree a strong grower. Fruit of medium size, flat, conical. Skin green, with a reddish blush. Flesh white, firm, juicy, subacid. Season, autumn.

Tyler's Kernel.—Tree a moderate grower. Fruit large, oblong, conical. Skin green, nearly covered with dull red, and sprinkled with white dots. Flesh yellowish white, firm, juicy and mildly acid. Season, autumn.

Early Strawberry.—Tree a moderate grower. Fruit small to medium in size, oblate. Skin yellow, with a russet cheek and a few streaks of dull red. Flesh white, firm, juicy and pleasantly acid. Season, autumn.

Pumpkin Sweet.—Tree a strong grower. Fruit large, roundish. Skin light green, with white dots and streaks. Flesh sweet, white, not juicy. Season, autumn.

Gideon's No. 20.—Tree a vigorous grower and productive. Fruit of medium size, conical. Skin greenish yellow. Flesh white, firm, crisp, juicy. Season, autumn.

Peasegood's Nonsuch.—Tree a spreading but moderate grower. Fruit large, globular. Skin whitish green, with a pale red blush and many small whitish dots. Flesh white, juicy, firm, mildly acid and pleasant. Season, autumn.

Wyken Pippin.—Tree a medium grower. Fruit below medium in size, oblate. Skin greenish yellow, sprinkled with gray dots. Flesh white, firm, juicy and pleasant. Season, autumn.

Margil.—Tree a moderate grower. Fruit of medium size, roundish oblate. Skin green, nearly covered with red. Flesh yellow, firm, juicy, with an aromatic pleasant flavour. Season, autumn.

Arabskoe.—Tree a vigorous grower and productive. Fruit large to very large, ribbed, conical. Skin green, nearly covered with smoky red, and sprinkled with small white dots. Flesh firm, white, coarse, juicy, and pleasantly acid. Season, late autumn.

Bismarck.—Tree a vigorous grower and productive. Fruit above medium in size, conical. Skin green, nearly covered with red. Flesh rather coarse, white, juicy, mildly acid. Season, November and December.

Nonpareil.—Tree a moderate grower. Fruit small, globular, flattened. Skin greenish yellow, nearly covered with russet. Flesh white, firm, moderately juicy and of pleasant flavour. Season, December.

Arabka Winter.—Tree a strong grower and productive. Fruit large to very large. Skin green, nearly covered with dull purple. Flesh white, firm, mildly acid and juicy. Season, late autumn.

Red Winter Calville.—Tree a moderate grower. Fruit large, oblong, conical. Skin green, with a reddish bronze cheek. Season, winter.

White Calville.—Tree a moderate grower. Fruit above medium size, oblong, ribbed. Skin greenish white. Season, winter.

Pomme d'Eve.—Tree a slow grower. Fruit under medium size, oblong, globular. Skin green, with a russet bronze cheek. Season, winter.

Red Winter Pearmain.—Tree a medium grower and productive. Fruit of medium size, oblong, conical. Skin greenish yellow, nearly covered with red and sprinkled with light dots. Season, winter.

Golden Harvey.—Tree a moderate grower. Fruit small, oblong, round. Skin rough, russet, with a dull red cheek. Flesh yellowish, firm, juicy, spicy, rich, and of pleasant flavour. Season, winter.

Golden Nonpareil.—Tree a moderate grower. Fruit small, roundish, of a golden yellow colour with a russet blush on the sunny side. Flesh juicy, crisp and acid. Season, winter.

Ingram.—Tree a vigorous grower. Fruit small, roundish, flattened. Skin green, with small stripes and splashes of red, and many small whitish dots. Season, winter.

Arkansas Beauty.—Tree a vigorous grower and productive. Fruit of medium size, globular. Skin green, with a bronze cheek and many small white dots. Season, winter.

Red Winter Pearmain.—Tree a moderate grower. Fruit of medium size, roundish, oblong, conical. Skin yellowish white, nearly covered with dull red, and freely sprinkled with light dots. Season, winter.

Reinette d'Angleterre.—Tree a moderate grower. Fruit above medium in size, roundish, conical. Skin yellow, with splashes of light red. Season, winter.

Bradford's Best.—Tree a vigorous grower. Fruit small to medium in size, round, flat, green, with a reddish cheek and many light dots. Very liable to black scab. Season, winter.

Jacob Sweet.—Tree a moderate grower. Fruit large, oblong, globular, somewhat conical. Skin green, with a brown red blush. Season, winter.

Danver's Winter.—Tree a vigorous grower and productive. Fruit above medium size, oblong, conical. Skin smooth, yellow. Season, winter.

De Chataignier.—Tree a moderate grower. Fruit small to medium in size, globular. Skin greenish yellow, and speckled with white dots. Season, winter.

Pyle's Red Winter.—Tree vigorous. Fruit of medium size, roundish, oblong, conical. Skin green, nearly covered with red, and sprinkled with whitish dots. Season, winter.

Indian.—Tree a vigorous grower and productive. Fruit above medium size, oblong, conical. Skin yellow, splashed and streaked over nearly the whole surface with two shades of red, and many small whitish dots. Flesh yellowish, fine grained, tender, crisp, juicy, mildly subacid and of good quality. Season, winter.

Dickinson.—Tree a vigorous grower and productive. Fruit above medium size, oblong, inclining to conical. Skin yellowish, with red nearly covering the surface, and freely sprinkled with whitish dots. Season, winter.

Parker's Pippin.—Tree a vigorous grower and productive. Fruit medium to large, round, conical. Skin yellow, with a considerable quantity of russet. Season, winter.

Taffet Winter.—Tree a strong grower. Fruit small to medium, oblate. Skin greenish yellow, with a blush. Season, winter.

Burckhardt's Reinette.—Tree a vigorous grower and productive. Fruit of medium size, round, flattish. Skin russet yellow. Season, winter.

Green Reinette.—Tree a vigorous grower. Fruit of medium size, roundish, flattened. Skin yellowish green, with a little russet. Season, winter.

Round Borsdorf.—Tree a vigorous grower. Fruit small, round, flat. Skin greenish yellow, with a bronze cheek. Season, winter.

Queen Olga.—Tree a vigorous grower and an early bearer. Fruit of medium size, long, oblong, tapering to the eye. Skin yellowish green, with a faint blush and a few white dots. Season, winter.

Cantil Sinap.—Tree a vigorous grower. Fruit oblong and of medium size, tapering to the eye. Skin yellowish green, with russet and splashes of pale red on the sunny side. Season, winter.

Doux d'Argent.—Tree a moderate grower. Fruit of medium size, round, flattened. Skin yellowish green, with many white dots. Flesh firm, juicy, mildly acid and of a fine and pleasant flavour. Season, winter.

Red Queen.—Tree a vigorous grower. Fruit of medium size, oblong, conical. Skin greenish yellow, with a warm blush. Season, winter.

North Carolina Limbertwig.—Tree a vigorous grower. Fruit of medium size, roundish, conical. Skin yellowish green, with a russet and dull red cheek. Season, winter.

Iowa Blush.—Fruited for the first time in 1897, and then classed as a winter apple. Proved to be a very fine keeper, keeping crisp and full flavoured until May.

Scarlet Cranberry.—Fruit small, flat and roundish, of fair quality, keeps with care until a year old, a plate each of the growth of 1897 and 1898 being shown in the Experimental Farm exhibit this year.

Carthouse.—Another apple reported on for the first time in 1897, keeps until the last of March in excellent condition, with a very small percentage of loss.

CRAB APPLES.

Red Siberian.—Tree a vigorous but slender grower. Fruit of medium size, flattish. Skin smooth, yellow, covered with bright red. Season, August.

Ogilvie's Crab.—Tree a vigorous grower and productive. Fruit above medium size, oblong, globular. Skin a warm yellow, with a pink blush. Season, August.

No. 3 Sweet.—Tree a vigorous grower and productive. Fruit of medium size, oval. Skin greenish white, with red in two shades covering nearly the whole surface, and a bluish bloom. Season, August.

Paul's Imperial.—Tree a vigorous grower and productive. Fruit above medium size, round, flattish. Colour white, nearly covered with purple, with a bluish white bloom. Season, August.

Peach.—Tree a vigorous grower and productive. Fruit of medium size, oblong. Skin green, with a handsome blush. Season, August.

Lady Elgin.—Tree a moderate grower. Fruit small to medium in size, oblong, flattened. Skin yellow, nearly covered with a pale dull red. Season, September.

Chickasaw.—Tree a vigorous grower. Fruit small, roundish globular. Skin green, nearly covered with a dull reddish tint. Season, September.

Alaska.—Tree a vigorous grower and productive. Fruit above medium in size, oblong, conical. Skin greenish white, splashed with dull pale red on the sunny side. Season, October.

PEARS.

Very few of the older pear trees bore fruit this year, and in those cases where they did bear, the crop was small and inferior in quality. The following varieties fruited for the first time :—

Beurre Jacob.—Tree a strong spreading grower and an early bearer. Fruit of medium size, oblong, pyriform. Skin warm yellow, with a red cheek and freely sprinkled with grayish dots. Flesh white, rather coarse, granular, not juicy, has a tendency to rot at the core. Season, August.

Beurre Giffard.—Tree a moderate grower. Fruit of medium size, pyriform, taperring to the stem. Skin greenish yellow, with patches of russet. Flesh white, tender, granular, medium juicy, sweet, quality good. Season, August.

Early Madelaine.—Tree an upright and vigorous grower. Fruit of medium size, obovate pyriform. Skin yellowish green, with russet specks. Flesh white, juicy, but not high flavoured. This pear seems very liable to crack.

Goodale.—Tree a vigorous grower but slow in coming into bearing. Fruit above medium size, oblong, obtuse pyriform. Skin light yellow with a blush on the sunny side and small patches of russet. Flesh white, juicy, yellowish, rather coarse, and gritty at the core. Season, September.

Colmar d'Été.—Tree a moderately vigorous grower. Fruit of medium size, roundish pyriform. Skin greenish yellow, freely sprinkled with grayish dots and occasionally a slight blush in the sun. Flesh white, coarse, not very good, often rots at core. Season, September.

St. Swithin.—Tree a vigorous grower. Fruit below medium size, obovate pyriform. Skin green, with a few russet dots. Flesh white, juicy, buttery and of fine flavour. Season, August and September.

Van Mons.—Tree a moderate grower. Fruit of medium size, obovate pyriform. Skin greenish yellow, with patches of russet and many brown dots. Flesh white, juicy, melting sweet and pleasant. Season, September.

Smith's Hybrid.—Tree a vigorous and upright grower. Fruit, large very similar to LeConte, but superior in quality to that variety. Season, August and September.

Duhamel du Monceau.—Tree a vigorous grower. Fruit of medium size, roundish pyriform. Skin pale greenish yellow, with a brownish red cheek in the sun, and sprinkled with russet dots. Flesh whitish, fine grained, sweet, juicy and of pleasant flavour. Season, October.

Japan Golden Russet.—Tree a vigorous and upright grower. Fruit small to medium in size, oval, stem long. Skin greenish russet, freely sprinkled with grayish dots. Flesh white, juicy, firm. Flavour peculiar but not very pleasant. Season, October and November.

Directeur Alphande.—Tree a vigorous grower. Fruit large, obtuse pyriform. Skin green, freely sprinkled with gray dots. Season, winter.

Emile d'Heyst.—Tree a vigorous grower. Fruit large, oblong pyriform. Skin yellow, with a bronze orange cheek in the sun, and many russet dots. Flesh yellowish white, fine grained, sweet, juicy and of a pleasant flavour. Season, November.

Dr. Jules Guyot, Rivers Princess and Durondeau, of the newer pears are the most productive varieties thus far tested for summer and autumn, and Knight's Monarch for winter.

PLUMS.

The European varieties of plums appear to find a congenial soil and climate in British Columbia. No other fruit on the Experimental Farm is so persistent and regular in producing large crops.

The Japanese plums bloom very profusely, but what fruit sets begins falling as soon as set, and very little is left by the time it is full grown.

The American plum trees bloom freely, but the blossoms fall, a few pounds being the best crop yet obtained from any of these varieties, while some of the European sorts of the same age have produced from one to three hundred pounds of marketable fruit.

View of part of a Washington Plum tree in fruit, growing on the Experimental Farm at Agassiz, British Columbia. [401]

The following varieties fruited for the first time this year :—

Richland.—Tree a vigorous grower. Fruit below medium in size. Skin greenish purple. Flesh greenish, juicy and of fine flavour. Ripe early in August.

Excelsior.—Tree a medium grower. Fruit small, round. Skin nearly scarlet. Flesh reddish, juicy and of fine flavour. Ripe early in August.

Monsieur June.—Tree a moderate grower. Fruit of medium size, roundish. Skin yellow, with a little red near the stem. Flesh yellow, juicy, melting, sweet and of fine flavour. Season, August.

Orel, No. 19.—Tree a vigorous grower. Fruit small to medium, oblong, globular. Skin purple, with a bluish bloom. Flesh greenish, juicy and of pleasant flavour. Season, August.

Yunkin Golden.—Tree a strong grower. Fruit below medium size, globular. Skin a rich reddish golden colour. Flesh yellow, juicy and of a rich, pleasant flavour. Season, Ausust.

Wangenheim.—Tree a medium grower. Fruit of medium size, oblong, oval. Skin deep purple, with a blue bloom. Flesh greenish, juicy, sweet and of a rich flavour. Season, August.

Luscombe's Nonsuch.—Tree a vigorous grower. Fruit above medium size, globular. Skin greenish yellow, with orange streaks. Flesh yellow, sweet but not very juicy. Season, August.

Huling's Superb.—Tree a strong grower. Fruit above medium size, roundish, oval, one side enlarged. Skin greenish yellow, with a light bloom. Flesh yellow, juicy and of a pleasant flavour. Season, August.

Reine Claude Rouge.—Tree a moderate grower. Fruit of medium size, round. Skin, reddish purple, with a thin bloom. Flesh, greenish, juicy, with a pleasant flavour. Season, last of August.

Reine Claude Vert.—Tree a moderate grower. Fruit small, roundish. Skin deep purple with a heavy blue bloom. Flesh, greenish, juicy with a pleasant flavour. Season, August.

Reine Claude Transparent.—Tree a moderate grower. Fruit of medium size, roundish with one side enlarged. Skin light yellow with reddish streaks. Flesh yellow, juicy, tender, sweet and of very fine flavour. Season, August.

President Courcelles.—Tree a moderate grower. Fruit below medium size, heart-shaped. Skin deep purple with a blue bloom. Flesh greenish, sweet, juicy, with a pleasant flavour. Season, August.

Pershore.—Tree a strong grower and productive. Fruit of medium size, pear shaped. Skin golden yellow. Flesh yellow, lacking in juiciness, slightly acid. Season, August.

Ickworth's Imperatrice.—Tree a medium grower. Fruit of medium size, roundish. Skin, purple with lighter streaks. Flesh greenish yellow, sweet, juicy and rich. Season, August.

Blubenthal Damson.—Tree a vigorous grower and early producer. Fruit one of the largest of the damsons, heart-shaped. Skin deep purple with a heavy blue bloom. Flesh green, juicy and sprightly. Season, August.

Cochet Pere.—Tree a vigorous grower and an early bearer. Fruit above medium in size, oblong globular. Skin golden yellow. Flesh yellow, sweet, not juicy, not of high quality. Season, August.

Des Bejonnières.—Tree vigorous and an early bearer. Fruit of medium size, globular. Skin yellow. Flesh yellow, juicy, sweet, and of fine quality. Season, August.

Late Transparent.—Tree a vigorous grower. Fruit of medium size, round. Skin greenish yellow, with a reddish cheek in the sun. Flesh yellowish, juicy, sweet and of fine flavour. Season, August.

Petite Mirabelle.—Tree a slow grower. Fruit very small, round. Skin whitish yellow, with small red dots, and a whitish bloom, Flesh yellowish, sweet, juicy and very pleasant, a free stone variety. Ripe, 20th August.

Bryanston's Gage.—Tree a strong grower. Fruit of medium size, oval. Skin yellow with a dull red cheek. Flesh yellow, coarse, juicy, sweet and of pleasant flavour. Season, late August.

Giant Prune.—Tree a strong and vigorous grower and early bearer. Fruit large, oval. Skin purple. Flesh firm, sweet, juicy and pleasant. Season, late August.

Bazalieza's Prune.—Tree a vigorous grower and productive. Fruit above medium size, oblong, oval. Skin reddish purple, with a whitish bloom. Flesh greenish, sweet, moderately juicy and of fine quality. Season, August.

CHERRIES.

The cherry crop has been a light one this year. Some of the sweet varieties bore fairly well, but the birds are fond of them, and before the crop was fit to pick, the birds had taken the most of it.

Quite a number of the Russian cherries fruited again this year, and as they are all more or less acid, they are not touched by birds. Some of them are of fair size, excellent for canning, and when fully ripe quite pleasant for table use, and as the trees begin to bear when young and are fairly productive, they are well worth planting both for home use and market.

The following are, so far as tested, the best of this class : Straus Wiechsel, Gruner Glass, Shadow Amarelle and Kings Morello. The following fruited this year for the first time :—

Cleveland.—Tree a strong grower. Fruit large, obtuse, heart shaped. Skin yellowish white, with a warm blush in the sun. Flesh yellowish, firm, juicy, sweet, and of pleasant flavour. Season, middle of June.

Glaskirsch Doppelte.—Tree a medium grower. Fruit under medium size, round. Skin light red. Flesh yellowish, juicy, sprightly, with a pleasant flavour. Season, last of June.

Orel No. 24.—Tree a medium grower. Fruit of medium size. Skin bright red. Flesh yellowish white, juicy, tender, mildly subacid, and of pleasant flavour. Season, last of June.

Kings Morello.—Tree a medium grower. Fruit of medium size, round. Skin pale red. Flesh yellowish white, juicy, tender, sprightly and refreshing. Season, early July.

Griotte d'Ostheim.—Tree a moderate grower. Fruit under medium size, nearly globular. Skin a reddish wine colour. Flesh firm, juicy, sprightly, and of fine quality. Season, early July.

Carnation.—Tree a vigorous grower. Fruit above medium size, round. Skin bright red. Flesh juicy, sprightly, nearly sweet, refreshing. Season, early July.

Centennial.—Tree a vigorous grower. Fruit large, round, deep red. Flesh juicy, tender, sweet and of very fine flavour. Season, July.

Rocky Mt. Cherries.—These bushes have made a strong growth this year, but none of them have fruited.

PEACHES.

The peach crop on the level land this year was almost an entire failure. The curl leaf was very prevalent, nearly every tree being seriously affected with it. The trees were sprayed with Bordeaux mixture, both before leafing out and several times after, but the spraying did not appear to be effective. In the valley the Amsden, Alexander, Early Canada and Mountain Rose had each a few peaches, and on the bench the Amsden and Hilborn had very good crops, and the curl leaf did not affect the foliage there, in fact it has never injured the foliage on either peach or nectarine trees on the benches over 300 feet above the valley.

APRICOTS.

The apricot, like the peach and nectarine blooms so early that the weather is very likely to be cool and wet, and the trees although blossoming profusely set very little fruit.

The European apricot trees grow vigorously for a few years and then the large limbs begin to die and the trees go to pieces.

The Russian varieties are hardier in the timber, and longer lived than the tenderer European sorts, but they do not fruit well. Our trees although large and vigorous growers, and blooming freely every year have not yet averaged 2 lbs. of fruit per tree per annum.

NECTARINES.

Only one of the nectarine trees fruited this year. The Spenser bore about 1 doz. nectarines, which seems to be about an average crop. In sheltered locations or on a wall, peaches, apricots or nectarines would perhaps fruit fairly well here, but in the open orchard they are not profitable.

MULBERRIES.

All the mulbery trees fruited freely again this season.

The fruit began ripening early in July, and continued in season until 1st September. Fruit juicy, sweet and pleasant, but drops from the tree when fully ripe.

MEDLARS.

The trees have made a strong growth, and have all produced a full crop. The Nottingham is perhaps the best, being a little the smoothest and evenest in size, but all the varieties are free producers, and the quality is nearly the same in them all.

SMALL FRUITS.

GOOSEBERRIES.

The gooseberries were sprayed with the lime sulphur and salt mixture during the winter, and with Bordeaux mixture before leafing out, and the sprayings with Bord eaux mixture were repeated several times during the spring and summer, but the results were not satisfactory. None of the European varieties escaped the mildew, except a few bushes planted on one of the benches, and these, although they have never been sprayed, have never shown the disease either on leaf or fruit.

GRAPES.

The season has been unusually free from fogs and smoke, and many more varieties of grapes ripened than has been the case heretofore, over sixty varieties were exhibited at the New Westminster exhibition. Here again there is a decided gain in getting on elevated lands, grapes on the bench ripened fully two weeks earlier than the same varieties on the level.

RED AND WHITE CURRANTS.

The season has been a good one for red and white currants and for all varieties of small fruits, there was sufficient rain early in the summer and in the autumn they had plenty of bright sunshine the result being in most cases a good crop of excellent fruit. The following extracts are from the notes taken of the different varieties.

RED AND WHITE CURRANTS.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Moore's Ruby (red.)	June 23	Vigorous ...	Large	Cluster, medium in length, fairly well filled, a little acid, of good flavour.	Productive.
Versailles (red).	" 23	" ...	"	Cluster, medium in length, open, of good flavour.	"
Fay's Prolific (red.)	" 23	" ...	"	Cluster, medium in length, of good flavour.	"
Red Langtraubige.	" 25	" ...	Medium	Cluster, long, and well filled, of good flavour.	Moderately productive.
Admirable (red)	" 25	" ...	Above medium	Cluster, long and full, mild, of pleasant flavour.	Fairly productive.
Victoria (red)..	" 25	" ...	Medium......	Cluster, long, fairly well filled, sweet, of good flavour.	Productive.
Eyatt's Nova (red.)	" 26	" ...	Above medium	Cluster, long, not very full, sweet, and of good flavour.	Moderately productive.
English Red....	" 26	" ...	"	Cluster, long and full, of very fine flavour.	Fairly productive.
Brandenburger (white.)	" 26	" ...	Large	Cluster, medium in length, fairly full, sweet, of good flavour.	Moderately productive.
White Kaiser...	" 26	" ...	Medium	Cluster, long, but not well filled, seeds yellowish red, of gocd flavour.	"
Raby Castle (red)	" 26	" ...	"	Cluster, medium in length, rather open, of good flavour.	Productive.
London Red....	" 26	" ...	"	Cluster, short, well filled, sweet, and of good flavour.	"
Transparent (white.)	" 26	" ...	"	Cluster, medium in length, open, of good flavour.	"
La Fertile (red).	" 26	" ...	Above medium	Cluster, medium in length, and full, of good flavour.	"
White Gondoin.	" 26	" ...	Medium	Cluster, medium in length, rather open, of good flavour.	Very productive.
La Hative......	" 26	" ...	"	Cluster, medium in length, and fairly full, of good quality.	Productive.
Knight's Early.	" 26	" ...	Small....	Cluster, short, not very full, of good flavour.	Moderately productive.
Prince Albert..	" 26	Moderately vigorous.	Medium......	Cluster long, moderately full, of good flavour.	"
Esperen's White	" 27	Vigorous ...	Large	Cluster, medium in length, and full, sweet and of good flavour.	Fairly productive.

RED AND WHITE CURRANTS—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Large White...	June 27	Vigorous....	Large........	Cluster, long and well filled, yellowish white, sweet and of good flavour.	Productive.
White Cherry..	" 27	" ...	Small....	Cluster, medium in length, fairly well filled, mild, sweet, and of good flavour.	Moderately productive.
Red Cherry....	" 27	" ...	Large....	Cluster, long and fairly well filled, of good flavour.	Productive.
White Pearl....	" 27	" ...	Medium......	Cluster, medium, fairly full, of good flavour.	Fairly productive.
Red Dutch.....	" 27	" ...	"	Cluster, medium, fairly well filled, of good flavour.	Productive.
White Dutch...	" 27	" ...	Above medium	Cluster, long, not very full, sweet, and of good flavour.	Fairly productive.
North Star.....	" 27	" ...	Medium.....	Cluster, long, well filled, good quality.	Productive.
La Conde	" 27	" ...	"	Cluster, medium in length, fairly well filled, of good flavour.	"
Rankin's Red..	" 28	" ...	Small....	Cluster, medium in length, fairly well filled, of good flavour, but a little acid.	Moderately productive.
Frauendorfer ..	" 28	" ...	Large........	Cluster, long, and fairly well filled, of good flavour, but a little acid.	"
Verrier's White	" 28	" ...	Above medium	Cluster, medium in length, fairly full, sweet, and of fine flavour.	Productive.
Chenonceau (red.)	" 28	" ...	Very large....	Cluster, medium in length, and fairly full, of very fine flavour.	Moderately productive.
Ringen's (red)..	" 28	" ...	Medium......	Cluster, medium in length, not very full, a little acid, of good flavour.	"
Beauty of St. Giles.	" 28	" ...	"	Cluster, medium in length and fairly full, a little acid, of good flavour.	Fairly productive.
Large White Dessert.	" 29	" ...	Large	Cluster, long, and well filled, acid, but of very good flavour.	"
De la Rochepoze	" 30	Moderately vigorous.	Small....	Cluster, short, quality inferior.	Not productive.
Champaigner (red.)	" 30	Vigorous ...	Medium......	Cluster, medium in length, fairly well filled, acid, but of good flavour.	Fairly productive.
Gondoin.	" 30	" ...	Small....	Cluster, short, inferior quality.	Not productive.
Large Red.....	" 30	" ...	Large medium	Cluster, long, fairly full, of good flavour.	Productive.
White Grape...	" 30	" ...	Large	Cluster, long, well filled, of good flavour.	"

BLACK CURRANTS.

Ambrafarbige..	July 1	Vigorous....	Medium......	Cluster, medium in length, of good quality.	Productive.
Victoria.......	" 1	" ...	"	Cluster, medium in length, of good quality.	"
Gewohnliche...	" 1	" ...	Above medium	Cluster, medium in length, sweet, of good flavour.	"
Dominion......	" 1	" ...	" .	Cluster, medium in length, of a fine mild flavour.	"

BLACK CURRANTS—*Continued.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Star	July 1	Vigorous	Large	Cluster, long, sweet, and of good flavour.	Productive.
London	" 1	"	Above medium	Cluster, long, mild, sweet, and of pleasant flavour.	"
Success	" 1	"	"	Cluster, long, sweet, and mild in flavour.	"
Prince of Wales	" 1	"	Large	Cluster, long, mild, of good flavour.	"
Ruler	" 1	"	"	Cluster, long, mild, sweet, and of good flavour.	"
Norton	" 1	"	"	Cluster, long, of pleasant flavour.	"
Middlesex	" 1	"	"	Cluster, medium in length, sweet, of good flavour.	"
Kentish Hero	" 2	"	Above medium	Cluster, medium in length, acid.	"
Bang Up	" 2	"	Large	Cluster, medium in length and very good quality.	"
Merneville de la Gironde.	" 2	"	"	Cluster, medium length and of good flavour.	"
Lennox	" 2	"	Above medium	Cluster, long, of very fair quality.	"
Lewis	" 2	"	Medium	Cluster, medium in length, of good flavour.	"
Beauty	" 2	"	Small	Cluster, short, of fair flavour.	"
Eagle	" 2	"	Above medium	Cluster, long, flavour a little rank.	"
Baldwin	" 2	"	Large	Cluster, medium in length, of good flavour.	"
Stuart	" 2	"	Medium	Cluster, medium in length, flavour a little rank.	"
Stirling	" 2	"	Large	Cluster, long, flavour a little rank.	"
Climax	" 2	"	"	Cluster, long, sweet, of good flavour.	"
Charmer	" 3	"	Small	Cluster, short, flavour rather rank.	Moderately productive.
Ontario	" 3	"	Large	Cluster, long, flavour rather rank.	Productive.
Lanark	" 3	"	Above medium	Cluster, short, flavour a little rank.	"
Wood	" 3	"	"	Cluster, long, of good flavour.	"
Louise	" 3	"	"	Cluster, long, of fairly good flavour.	"
Ogden's Black	" 3	"	Small to large.	Cluster, short, flavour a little rank.	"
Henry	" 3	"	Very large	Cluster, long, sweet of good flavour.	"
Oxford	" 3	"	Small	Cluster, medium in length, a little rank, but of good flavour.	"
Parker	" 4	"	Medium	Cluster, medium in length, flavour rather rank.	"
Bella	" 4	"	Small	Cluster, fairly good, flavour moderately good.	"
Eclipse	" 4	"	Above medium	Cluster, medium in length, a little acid, but of good flavour	"
Lee's Prolific	" 4	"	Large	Cluster, medium in length, flavour fairly good.	"
Pearce	" 5	"	"	Cluster, medium in length, sweet and of mild flavour.	"
Monarch	" 5	"	Above medium	Cluster, medium in length, mildly acid, flavour pleasant	"
Black Naples	" 5	"	Large	Cluster, long, sweet, mild, of good flavour.	"

BLACK CURRANTS—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Kentville	July 6	Vigorous ...	Medium	Cluster, short, flavour rather rank.	Productive.
Ethel	" 6	" ...	Large	Cluster, long, a little acid, but of good flavour.	"
Champion......	" 8	" ...	Medium.....	Cluster, short, flavour rather rank.	Not productive.
Manitoba Wild.	" 10	Not vigorous, yellow flowers.	Small	Fruit of poor quality	"

YELLOW AND RED RASPBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Crimson Beauty	June 10	Vigorous ...	Medium......	Bright red, round, firm, a good shipper.	Very productive.
Champion......	" 11	"	Large	Red, round, sweet and of pleasant flavour, but soft.	Productive.
Thompson	" 12	"	Above medium	Bright red, moderately firm, and of good quality.	Very productive.
Paragon	" 16	" ...	Large	Bright red, of fair quality...	Productive.
Braumforth's Seedling.	" 17	"	Below medium	Dark red, of fairly good quality, but crumbly.	"
Brinckle's Orange.	" 17	"	Large	A handsome berry of very good quality.	"
Falstaff........	" 17	"	Medium......	Clear red, conical, firm, of good flavour.	"
Battler's Giant.	" 17	"	Above medium	Dark red, round, sweet and of pleasant flavour.	"
Muskingum....	" 18	" ...	" ..	Dark red, round, conical, sweet, of good flavour.	Very productive.
Heebner......	" 20	" ...	" ..	Red, handsome, firm, sweet and of good flavour.	Productive.
Hornet	" 20	"	Very large ...	Dark red, round, firm, of good flavour.	"
Golden Queen..	" 20	"	Large	Round, sweet and of very good quality.	"
Marlboro'......	" 20	"	Small.........	Fairly firm, but not of very good quality.	"
Lord Beaconsfield.	" 20	"	Large	Dark red, firm, a little acid, but of good quality.	Very productive.
Belle de Fontenay.	" 20	"	Medium	Red, large, crumbly and undesirable.	Productive.
All Summer....	" 20	"	Above medium	Clear red, large, firm, good flavour, continued in bearing till Aug. 1.	"
Franconia......	" 20	Vigorous ...	Medium......	Dark red, soft, not of very good quality.	"
Turner	" 20	Moderately vigorous.	Small.........	Good flavour, but soft........	"
White Antwerp	" 20	" ..	Medium......	Yellowish-white, round, sweet soft, of fair flavour.	Fairly productive.
Northumberland Fill Basket.	" 20	Vigorous....	Very large....	Dark red, conical, firm, of good flavour, a very good berry, continued long in bearing.	Productive.
Phœnix........	" 20	Moderately vigorous.	Above medium	Dark red, firm, of good quality.	Fairly productive.
Goliath	" 21	Vigorous....	Medium.. ...	Dark red, round, sweet, of good flavour, but soft.	Productive.
Duke of Brabant	" 21	"	Large	Bright red, firm, sweet, of pleasant flavour.	"
Sir John......	" 21	Moderately vigorous.	Medium.	Red, crumbly, soft, of inferior quality.	Moderately productive.
R. B. Whyte...	" 21	" ..	"	Dark red, round, soft.........	Productive.
Barnet	" 21	" ..	Small	A few poor crumbly berries...	Not productive.

YELLOW AND RED RASPBERRIES—*Continued.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Shaffer's Colossal.	June 21	Vigorous....	Very large....	Purple-red, firm and acid.....	Productive.
Yellow Antwerp.	" 21	" ..	Small.........	Round, crumbly, poor........	"
Spineless Yellow	" 21	" ...	Medium......	Long, conical, flavour fair, soft	Productive.
Autumn Surprise.	" 22	Moderately vigorous.	Small........	Yellow, soft, sweet and of pleasant flavour.	Moderately productive.
Lady Anne	" 22	" ..	"	Yellow, crumbly, of little value	Not productive.
Craig..........	" 22	Vigorous ...	Above medium	Clear red, crumbly, of fair flavour.	Productive.
Miller	" 22	" ...	Medium......	Red, round, firm, not a good flavour.	"
Lemercier	" 22	" ...	Large	Red, round, sweet, of fine flavour.	"
Sugar of Metz..	" 22	Moderately vigorous.	Medium......	Yellow, crumbly, sweet and of pleasant flavour.	"
French Vice-President.	" 22	Vigorous ...	Very large ...	Red, largest berry grown on the farm, long, conical, of good flavour, but it is a little difficult to pick off stem.	Very productive.
Kentish Giant..	" 22	" ...	Above medium	Red, of good quality.........	Moderately productive.
Prince of Wales	" 22	Moderately vigorous.	Small........	Not of very good quality	Productive.
Herrenhaus Red Perpetual.	" 22	" ..	Medium... ..	Firm, of fairly good flavour...	"
Col. Wilder. ...	" 22	" ..	Above medium	Pale yellow, soft, sweet and of pleasant flavour.	"
Arnold's Hybrid	" 22	Vigorous ...	Medium......	Dark red, soft, crumbly, sweet, of pleasant flavour.	"
Clarke.........	" 22	" ...	"	Fairly firm and of good quality	"
Carter's Prolific	" 22	" ...	Large	Red, of very good quality.....	"
Chili..........	" 23	" ...	"	Light red, crumbly, of good flavour.	"
Garfield........	" 23	" ...	Medium......	Bright red, round, conical, firm, rather dry, would ship well.	Very productive.
Muriel	" 23	" ...	Above medium	Deep red, conical, firm, of fine flavour.	Moderately productive.
New Falstaff...	" 24	" ...	Medium......	Dark red, conical, sweet, firm, would ship well.	Productive.
Carman	" 24	Moderately vigorous.	Small........	Red, firm, of good flavour.....	Not productive.
Sarah	" 24	Vigorous ...	Above medium	Bright red, firm, sweet and of excellent flavour.	Moderately productive.
Large Yellow ..	" 25	" ...	Large	Sweet and of good flavour.....	Productive.
Queen of the Market.	" 25	" ...	Very large....	Dark red, conical, firm, sweet, of good flavour.	"
Malta..	" 25	" ...	Above medium	Yellow, sweet, crumbly, of fair flavour.	"
Conrath.......	" 25	" ...	Large	A very good berry, handsome, but a little acid.	"
Columbia......	" 25	" ...	"	Dark purple, round, firm, and acid.	Moderately productive.
Beehive.... ..	" 26	" ...	Medium......	Dark red, conical, sweet and firm.	Productive.
American Yellow.	" 26	" ...	Small........	Round, sweet and of pleasant flavour.	"
Billard's Perpetual.	" 27	" ...	Large	Clear red, crumbly but of good flavour.	"
Cuthbert	" 28	" ...	"	Dark red, firm and of very good quality.	"
Red Herrenhauser.	" 28	" ...	Small.......	Round, poor quality..........	"
Percy	" 28	" ...	Large	Dark purple, round, firm and of good flavour.	"

YELLOW AND RED RASPBERRIES—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Hudson River Antwerp.	June 29	Vigorous ...	Small.	Dark red, soft, fair flavour, a poor berry.	Very productive.
Queen Victoria.	July 1	" ...	Medium	A few poor, crumbly berries .	Not productive.
Garnet	" 7	" ...	Small	Dark purple, of fair flavour. ..	Moderately productive.

BLACK CAP RASPBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Smith's Prolific.	June 24	Vigorous ...	Medium	Not very good......	Moderately productive.
Early Ohio	" 25	" ...	Small	A poor berry	Not productive.
Nemaha	July 6	" ...	Large	Reddish black, firm, fine	Productive.
Lovett	" 6	" ...	Medium	Of fair quality	Fairly productive.
Older	" 6	" ...	Medium to large.	Of fair quality, juicy	"
Palmer....	" 7	Moderately vigorous.	Small	Not very good, dry and seedy.	"
Kansas.......	" 10	Vigorous....	Small to medium.	Firm, of good quality	Moderately productive.
Cromwell......	" 10	" ...	Small	Inferior berries....	" "
Ada...........	" 10	" ...	Medium	Not very good	Productive.
Gregg	" 12	" ...	Large....	Firm and of good quality.....	"
Progress	" 12	" ...	"	Firm, sweet and of good quality	Fairly productive.
Jackson's May King.	" 12	" ...	Small	Of poor quality	Moderately productive.
Minnie	" 12	" ...	Medium	Dark purple, crumbly, acid, with many imperfect berries	" "
Hopkins......	" 12	" ...	"	Firm and juicy, good	" "

Black cap raspberries require considerable moisture at time of ripening—as well as heat and sunshine—to bring them to the best condition. This year the weather was hot and dry when they were ripening which caused the fruit to dry up, and made them seedy and comparatively tasteless. On this account the quality of the fruit was not as good as usual and the yield was small.

BLACKBERRIES.

A quart each of the following varieties were shipped by express at three different times, to the McPherson Fruit Co., Winnipeg, to test their shipping qualities.

They rank in the following order:—

Eldorado. The best in quality and a good shipper.
Wilson's Early. Equal to the Eldorado as a shipper.
Early Cluster.
Agawam.
Snyder.
Stone's Hardy.
Minnewaska.
Ohmer.
Early King.
Lawton.
Taylor's Prolific.
Kittatinny.

All but the three last varieties reached Winnipeg in fairly good condition. With proper care in picking and crating and a refrigerated car in which to ship, a good many varieties of blackberries could be marketed in Winnipeg from the Pacific coast with profit.

BLACKBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Tecumseh	July 25	Moderately vigorous.	Small	Uneven in shape, inferior in flavour.	Not productive.
Thompson's Mammoth.	" 27	Vigorous	Small to medium.	Berries imperfect and of poor quality.	"
Kittatinny	" 27	"	Large	Fruit rather acid, of fair flavour.	Productive.
Ohmer	" 27	"	"	Fruit moderately firm and of fair flavour.	"
Wilson's jr	" 29	"	Small	Uneven in shape and in ripening, acid, of fair quality.	Not productive.
Lovett's Best	" 30	"	"	Uneven in size and inferior in every way.	"
Oregon Ever-bearing.	Aug. 10 to Sept. 20.	"	Above medium	Acid, but of fair flavour	Productive.
Maxwell	Aug. 10	Moderately vigorous.	Small	Not a very good berry	Not productive.
Child's Tree	" 16	"	"	A poor berry	"
Early King	July 10	Vigorous	Medium	Glossy black, of good flavour	Productive.
Minnewaska	" 10	"	Large	Glossy black, berry firm and good.	Moderately productive.
Early Harvest	" 11	Moderately vigorous.	Small	Not highly flavoured	Not productive.
Hansel	" 15	Vigorous	Large	Glossy black, of fair quality	"
Snyder	" 18	"	"	Of good quality and firm	Productive.
Early Cluster	" 18	"	Medium	Sweet, firm and of good flavour	"
Agawam	" 20	"	Above medium	Fruit firm, sweet and of good quality.	"
Erie	" 20	"	Small to very large.	Fruit black, acid, and not of very good quality.	Moderately productive.
Taylor's Prolific	" 20	"	Large	Fruit sweet and of good quality	Productive.
Stone's Hardy	" 22	"	Medium	Fruit glossy black, firm, and of good flavour.	"
Eldorado	" 22	"	Very large	Fruit glossy black, sweet, and of very fine flavour.	Very productive.
Lawton	" 25	"	Large	Sweet, firm, and of good flavour	Productive.
Crystal White	" 25	"	Small	Fruit of inferior quality	Fairly productive.
Wilson's Early	" 25	"	Above medium	Fruit firm, a little acid, but of good flavour.	Productive.

STRAWBERRIES.

Hautbois	June 4	Vigorous	Below medium	Sweet; flavour fair; soft	Not productive.
Daisy	" 5	"	Above medium	Of fine flavour; firm; a good berry.	Productive.
Chairs	" 5	"	"	Of good flavour; firm; continues long in bearing.	"
Van Deman	" 5	"	"	A little acid, but of good flavour; firm.	"
Smith's Seedling	" 6	" a little rust on leaves.	Medium to large.	Of poor flavour; soft	Fairly productive.
Philips' Seedling	" 7	Vigorous	Above medium	Of poor quality	Productive.
Omega	" 7	"	Large	Of good flavour; firm	"
Warfield	" 8	"	Above medium	Of very good flavour; firm; continues long in bearing.	"

STRAWBERRIES.—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Alexander II...	June 9	Vigorous....	Above medium	Sweet and of good flavour; firm.	Productive.
Beder Wood ...	" 9	Moderately vigorous.	" ..	Of good flavour; firm	"
Iowa Beauty....	" 10	Vigorous ...	" ..	" "	"
Bebee's Seedling No. 2.	" 10	" ..	Large	Of good quality; firm	"
Bebee's Seedling No. 3.	" 11	" ..	"	Sweet and of good flavour; firm.	"
Alpha	" 11	" ..	Above medium	Of good quality; firm.........	"
Maxwell	" 11	" ..	Medium......	Fairly good in flavour; not uniform in shape; firm.	"
Parker Earle...	" 11	" ..	Large	Of good quality; firm.........	"
Anna Kennedy.	" 11	" ..	Medium......	Of fairly good flavour; firm...	Fairly productive.
Bissel	" 11	" ..	Large	Firm and of good flavour......	Productive.
Windsor Chief..	" 11	" ..	"	A little acid, but of good flavour.	"
Imp. Jucunda..	" 12	" ..	Above medium	A bright red, firm berry, of good flavour.	"
Eclipse	" 12	" ..	Medium to large.	Of good flavour; fairly firm...	"
Beverly........	" 13	" ..	Above medium	Of good quality; fairly firm...	"
Tennessee.......	" 13	Moderately vigorous.	Medium......	A berry of poor flavour	Not productive.
Empress Eugenie.	" 13	" ..	Above medium	Of good flavour; firm.........	Fairly productive.
Yale	" 13	Vigorous ...	" ..	Acid, and rather poor in flavour.	Productive.
Pine Apple.....	" 13	" ..	Large medium	Sweet, soft and insipid........	Fairly productive.
H. W. Beecher.	" 13	" ..	"	Firm and of good flavour......	Productive.
Greenville......	" 14	" ..	Above medium	A firm, handsome and good flavoured berry.............	"
Timbrel	" 14	" ..	Large	Of good flavour and firm	Not productive.
Weston	" 14	Moderately vigorous.	Medium......	Rather acid, but of fair flavour.	"
Mary	" 14	Vigorous ...	Irregular, small to large.	Firm and fairly good in flavour.	Moderately productive.
Bonny Lass....	" 14	" ..	Large medium	Of good flavour and firm......	Productive.
Sir Joseph Paxton.	" 15	" ..	Medium......	Of fair quality; firm..........	Not productive.
Dr. Hogg......	" 15	" ..	"	Sweet and of pleasant flavour.	Not very productive.
Brandywine....	" 15	" ..	Large	Of good flavour; firm	Productive.
Laxford Hall...	" 20	Feeble......	Small.........	Berry poor in flavour and imperfect.	Not productive.

METEOROLOGICAL RECORD.

—	Date of Highest Temperature.	Degrees	Date of Lowest Temperature.	Degrees	Rainfall.	Snowfall.	Sunshine.
1897.					Inches.	Inches.	H. M.
December	28th	52	12th	15	3·33	3	31 18
1898.							
January	31st	49	23rd	20	4·56	5	28 18
February	26th	63	1st & 2nd	30	7·25	....	49 18
March	5th	67	25th & 26th	23	2·05	3	111 18
April	24th	78	3rd	32	3·50	....	208 48
May	25th	93	20th	36	2·62	....	199 12
June	8th and 9th	90	1st	42	4·19	....	168 24
July	30th	100	15th	46	3·41	....	248 54
August	10th	103	22nd, 27th 20th	49	·81	....	221 30
September	8th	96	30th	36	3·93	....	125 30
October	2nd	72	5th	34	7·21	....	75 48
November	1st	58	21st	20	3·69	12	38 36
					46·55	20	1,506 54
Totals for 1897	....	....	....		65·95	45½	1,474
" 1896	....	....	....		63·47	75½	1,417 27

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS, FOR THE YEAR ENDING 30TH JUNE, 1898.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1897-98.

Live stock	$ 985 20
Feed for stock, including veterinary services	563 46
Seed grain, seeds, trees, &c	763 79
Implements, tools, hardware and supplies	702 84
Drainage and drain tiles	627 64
Manure and fertilizers	309 09
Travelling expenses	982 11
Exhibition expenses	171 55
Blacksmithing, harness supplies and repairs	500 20
Bee supplies	303 83
Salaries	1,855 17
Wages, farm work, including experimental work with grain and other farm crops; also, salaries of farm foreman and Director's assistant in experimental work	4,666 66
Wages, care of stock	2,310 32
Chemical department	938 60
Botanical and entomological department	1,052 42
Horticultural department	3,673 32
Poultry department	1,491 47
Forestry department and care of grounds	1,716 43
Arboretum	1,285 34
Office help, correspondence branch and messenger service	3,350 34
Printing and stationery	730 55
Seed testing and care of greenhouses	857 38
Dairy department	754 94
Museum	14 87
Contingencies	435 96
" books and newspapers	70 48
" telegrams and telephones	148 35
Steers purchased for feeding experiments	654 32
	31,916 63
LESS—Proceeds of sale of steers purchased for feeding experiments	951 40
	$ 30,965 23

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1897-98.

Live stock	$ 2,398 39
Feed for stock, including veterinary services	527 21
Seed grain, seeds, trees, &c	87 37
Implements, tools, hardware and supplies	327 70
Draining and drain tiles	146 95
Manure and fertilizers	183 57
Travelling expenses	599 80
Exhibition expenses	240 80
Blacksmithing, harness supplies and repairs	128 17
Salaries, including proportion of salaries for general work, Ottawa	3,923 81
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	1,994 97
Wages, care of stock	1,036 10
Chemical department	547 52
Botanical and entomological department	400 53
Poultry department	18 15
Forestry department, including care of grounds	75 91
Office help	......
Seed grain distribution	272 15
Contingencies (including postage $46.13)	126 92
" printing and stationery	69 10
" books and newspapers	28 75
" Telegrams	20 91
Steers purchased for feeding experiments	308 00
	13,462 78
LESS—Proceeds of sale of steers purchased for feeding experiments	593 00
	$ 12,869 78

EXPERIMENTAL FARM, BRANDON, MANITOBA—EXPENDITURE, 1897-98.

Live stock	42 20
Feed for stock, including veterinary services	69 67
Seed grain, seeds, trees, &c	210 10
Implements, tools, hardware and supplies	581 54
Draining	88 50
Travelling expenses	106 65
Exhibition expenses	286 94
Blacksmithing, harness supplies and repairs	228 09
Salaries, including proportion of salaries for general work, Ottawa	2,482 18
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	3,393 85
Wages, care of stock	609 25
Chemical department	547 51
Botanical and entomological department	400 52
Forestry department, including care of grounds	376 16
Poultry department	66 75
Office help (including delivery of mail, $136)	377 36
Seed grain distribution	691 93
Tree distribution	538 05
Contingencies, (including postage, $79.47)	149 10
" printing and stationery	69 88
" books and newspapers	23 00
" telegrams and telephones	41 85
Bee supplies	25 62
Steers purchased for feeding experiments	399 75
	11,806 45
Less—Proceeds of sale of steers purchased for feeding experiments	628 29
	$ 11,178 16

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE 1897-98.

Live stock	178 80
Feed for stock, including veterinary services	75 91
Seed grain, seeds. trees, &c	101 33
Implements, tool, hardware and supplies	473 05
Manure and fertilizers	......
Travelling expenses	150 81
Exhibition expenses	130 66
Blacksmithing, harness supplies and repairs	216 40
Salaries, including proportion of salaries for general work, Ottawa	2,482 17
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,720 24
Wages, care of stock	1,465 49
Chemical department	547 51
Botanical and entomological department	400 52
Poultry department	103 65
Forestry department, including care of grounds	280 53
Office help	471 25
Seed grain distribution	398 82
Tree distribution	173 64
Contingencies, (including postage, $153.03)	227 96
" printing and stationery	34 93
" telegrams	6 55
Bee supplies	11 89
Steers purchased for feeding experiments	335 50
	10,987 61
Less—Proceeds of sale of steers purchased for feeding experiments	703 38
	$ 10,284 23

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1897-98.

Live stock	$ 1 50
Feed for stock, including veterinary services	130 12
Seed grain, seeds, trees, &c	80 55
Implements, tools, hardware and supplies	132 61
Draining and drain tiles	22 50
Manure and fertilizers	65 35
Travelling expenses	228 19
Exhibition expenses	69 80
Blacksmithing, harness supplies and repairs	67 30
Salaries, including proportion of salaries for general work, Ottawa	2,482 17
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,889 99
Wages, care of stock	461 75
Chemical department	547 51
Botanical and entomological department	400 52
Poultry department	57 25
Forestry department	159 02
Office help	120 00
Seed grain distribution	86 72
Tree distribution	12 57
Clearing land	581 75
Contingencies (including postage, $83.37)	91 90
" printing and stationery	19 26
" books and newspapers	22 00
" telegrams	4 10
Bee supplies	50
	$ 8,734 93

SUMMARY.

Central Experimental Farm		30,965 23
Nappan "		12,869 78
Brandon "		11,178 16
Indian Head "		10,284 23
Agassiz "		8,734 93
Seed grain distribution		3,467 67
Printing bulletins and distribution of bulletins and reports	$ 4,000 00	
Less special sum in estimates for this item	4,000 00	
		$ 77,500 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND 31st DECEMBER, 1898.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

14 Horses	$	800 00
2 Ayrshire cattle		120 00
1 Durham "		100 00
2 Guernsey "		172 00
3 Jersey "		110 00
7 Canadian "		186 00
23 Grade "		748 00
3 Yorkshire swine		65 00
3 Berkshire "		67 00
4 Tamworth "		82 00
3 Poland China swine		67 00
2 Chester white "		50 00
21 Grade swine		116 00
Farm machinery		1,891 00
Farm implements		683 50
Vehicles, including farm wagons and sleighs		1,034 00
Hand tools, hardware and sundries		1,018 30
Harness		274 75
Dairy department, machinery, &c		605 55
Horticultural department, implements, tools, &c		290 80
Forestry " "		440 50
Botanical " "		4 50
Poultry " 240 fowls		226 00
" " implements, furnishings, &c		104 50
Bees and apiarian supplies		406 10
Chemical department, apparatus and chemicals		1,870 65
Books in several departments		401 80
Greenhouse plants, supplies, &c		1,348 85
Furniture at Director's house		1,215 00
Office furniture and stationery		1,501 25
	$	16,000 05

EXPERIMENTAL FARM, NAPPAN, N. S.

7 Horses	$	650 00
5 Guernsey cattle		635 00
5 Holstein "		290 00
5 Ayrshire "		355 00
32 Grade "		1,146 00
2 Yorkshire swine		45 00
4 Berkshire "		46 00
3 Tamworth "		42 00
34 Grade "		200 00
28 Sheep		134 00
47 Fowls		34 60
Bees and apiarian supplies		35 00
Vehicles, including farm wagons and sleighs		365 00
Farm machinery		474 50
" implements		206 00
Hand tools, hardware and sundries		313 50
Harness		167 50
Furniture for reception room, and bedroom for visiting officials		189 25
" supplies and books for office		62 00
	$	5,390 35

EXPERIMENTAL FARM BRANDON, MANITOBA.

10 Horses	$	600 00
3 Ayrshire cattle		125 00
3 Durham "		175 00
1 Guernsey "		75 00
6 Holstein "		275 00
8 Grade "		160 00
2 Chester White swine		30 00
4 Tamworth "		63 00
4 Berkshire "		45 00
59 Fowls		56 00
Bees and apiarian supplies		86 20
Vehicles, including farm wagons and sleighs		475 00
Farm machiney		987 00
" implements		630 00
Hand tools, hardware and sundries		619 42
Harness		215 [illegible]
Furniture for reception room and bedroom for visiting officials		162 55
" supplies and books for office		182 40
	$	4,962 07

EXPERIMENTAL FARM, INDIAN HEAD, N. W. T.

15 Horses	$	1,600 00
1 Ayrshire cattle		50 00
9 Durham "		770 00
3 Holstein "		120 00
14 Grade "		375 00
3 Yorkshire swine		40 00
3 Berkshire "		55 00
5 Tamworth "		70 00
1 Chester white "		10 00
63 Fowls		44 00
Bees and apiarian supplies		54 47
Vehicles, including farm wagons and sleighs		505 00
Farm machinery		1,174 50
" implements		595 00
Hand tools, hardware and sundries		414 45
Harness		197 40
Furniture for reception room and bedroom for visiting officials		189 00
" supplies and books for office		229 25
	$	6,493 07

EXPERIMENTAL FARM, AGASSIZ, B. C.

6 Horses	$	630 00
5 Durham cattle		350 00
5 Ayrshire "		200 00
7 Holstein "		405 00
1 Grade "		30 00
5 Dorset horned sheep		45 00
2 Berkshire swine		45 00
3 Tamworth "		59 00
60 Fowls		55 80
Bees and apiarian supplies		40 00
Vehicles, including farm wagons		225 00
Farm machinery		545 00
" implements		203 00
Hand tools, hardware and sundries		183 05
Harness		78 00
Furniture for reception room and bedroom for visiting officials		223 50
" supplies and books for office		132 00
	$	3,449 35

W. H. HAY,
Accountant.

INDEX.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARM

REPORTS

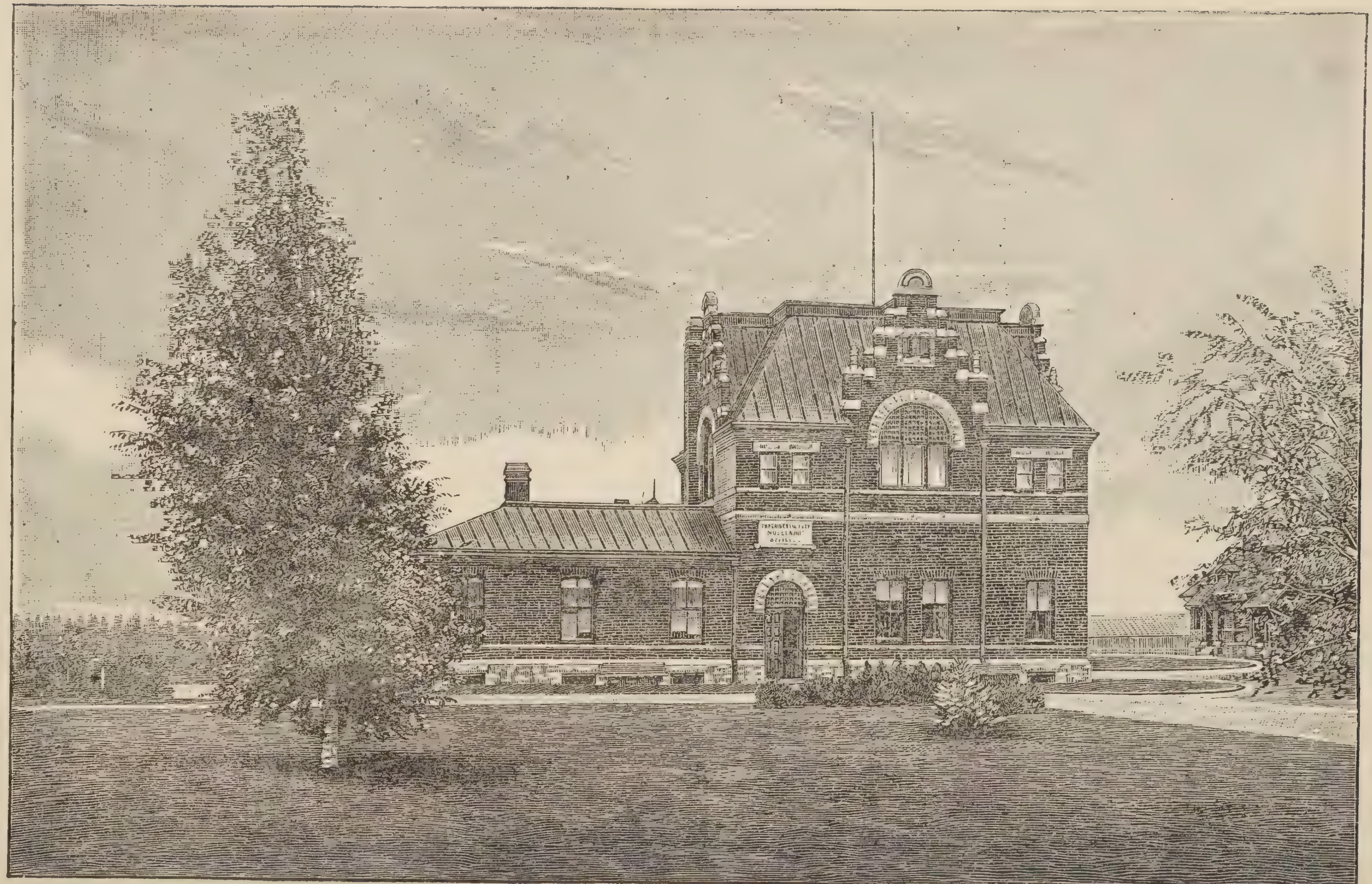
OF THE

DIRECTOR - - - - - - - -	WM. SAUNDERS, LL.D.
AGRICULTURIST - - - - - -	J. H. GRISDALE, B.AGR.
HORTICULTURIST - - - - - -	W. T. MACOUN
CHEMIST - - - - - - -	F. T. SHUTT, M.A.
ENTOMOLOGIST and BOTANIST - - -	JAS. FLETCHER, LL.D.
POULTRY MANAGER - - - - - -	A. G. GILBERT

FOR

1899

OTTAWA
GOVERNMENT PRINTING BUREAU
1900



Office Building and Museum of the Central Experimental Farm.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS.

Ottawa, December 1, 1899.

Sir,—I take pleasure in submitting for your approval the thirteenth annual report of the work done, and in progress, at the several Experimental Farms.

In addition to my own report, you will find appended, reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific investigations in the chemical laboratory and the information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand made by the farmers throughout this country for the annual reports and other publications issued from the experimental farms, is a gratifying evidence of the desire for information among this class of the community, also of the high esteem in which these records of the work of the farms are held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit grower and that they may assist in advancing the interests of agriculture and horticulture in Canada.

I have the honour to be, sir,

Your obedient servant,

WM. SAUNDERS,

Director Experimental Farms.

To the Honourable

The Minister of Agriculture,

Ottawa.

ANNUAL REPORT

OF THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR, WM. SAUNDERS, LL D., F.R.S.C., F.L.S.

The particulars herewith submitted of the operations conducted at the five Dominion Experimental Farms during 1899 for the advancement of agriculture, horticulture and arboriculture will, it is hoped, include much which will be of interest and of value to Canadian farmers. During the thirteen years which have passed since these farms were established great changes for the better have taken place in farm life. The position of the farmer in the community has been improved and his work is now carried on with greater intelligence and with more financial success. In most instances the home has been made more attractive, the family surrounded with greater comforts and much of the drudgery formerly associated with the farmers' calling, has been lifted from his shoulders, by the introduction of methods of co-operation, by improvements in machinery and by the dissemination of valuable experience gained in reference to all branches of farm work in this country. He has thus received benefit from the work of others, has acquired a wider knowledge of the principles which underlie successful farming, and has thus been able to bring more skill to bear on the many sided work in which he has been engaged. The farmer now seldom sells coarse grains from his farm but converts these by feeding, into concentrated animal products and thus retains the elements of fertility which these crops have taken from the land and restores them to the soil in the manure. He thus supplies for future crops much plant food in a readily available form. The experience gained on the Experimental Farms widely disseminated in reports and bulletins has exercised an important influence in bringing about the changes and improvements referred to. In the planning and carrying out of the many experiments explained in the Annual Reports the special needs of farmers residing in the climates in which these farms are located have been carefully considered, and much efficient help has thus been rendered.

CROP RESULTS OF THE PAST SEASON.

The season of 1899 has been characterized by good crops over the greater part of the Dominion, and reference to the particulars of the crops harvested at the several experimental farms will show that the results obtained at these institutions are considerably above the average of the country. The success achieved has been due mainly to a more thorough preparation of the soil, greater care in the preserving and using of barnyard manure, the careful selection of well matured and plump seed of the most productive sorts and early sowing, all of which may easily be put in practice by the average farmer.

The results had in 1899 from the uniform trial plots of grain, fodder corn, roots and potatoes were published as heretofore early in the season in bulletin form, so that the particulars which might influence farmers in the choice of seed were in their hands for consideration in good season. The average results of a five years trial of all the more important sorts furnishes additional evidence in support of the view, that under uniform conditions some varieties are much more productive than others, and that this desirable tendency in some instances is so strong that it asserts itself under all the different climatic and soil conditions which obtain at the Central and Branch Experimental Farms. The relative earliness in ripening which under some conditions is almost as important as productiveness has been further investigated and the results reached confirm the views held by most careful students of this subject that as a rule any great increase in earliness in ripening of grain is accompanied by a decrease in yield.

EARLY, MEDIUM AND LATE SOWINGS.

The experiments which have now been continued for ten years to gain information as to the best time to sow, have furnished evidence so conclusive in favour of early sowing that it will probably not be thought necessary to continue these any longer.

VACANCY IN THE STAFF FILLED.

Early in the year the position of Agriculturist of the Central Experimental Farm which has remained vacant since the resignation of Prof. J. W. Robertson in 1896, was filled by the appointment of Mr. J. H. Grisdale. Mr. Grisdale takes charge of the stock, the dairy and the field crops. The experimental plots will remain under the charge of the Director.

NEW BUILDINGS.

An excellent new root house has been built during the year with substantial stone walls and a superstructure of wood two storeys high. The lower one has been arranged for the storage of the farm wagons, sleighs, &c., with a large room at one end for the distribution of samples of seed grain. The upper storey has been fitted for the storage of miscellaneous material and furnishes also a convenient place for preparing grain and other farm products for exhibition purposes. The size of this building, outside meaurement is 104 ft. by 34.

Two circular silos have also been built to take the place of the two square silos formerly used, which had become so much decayed as to be unfit for further service. The new silos are 16 ft. 10 in. by 30 feet and have capacity for the storage of about 125 tons of ensilage in each.

A suitable building has also been erected for the curing of tobacco, furnishing space sufficient for two or three acres of crop.

EXPERIMENTAL WORK

CONDUCTED AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, ONTARIO.

EXPERIMENTS WITH OATS.

The number of varieties of oats tested in the uniform trial plots during the season of 1899 was seventy-eight. These experiments have been conducted to gain information as to the relative yield, earliness and other characteristics of the several sorts. The soil was a heavy sandy loam mixed with clay, of good quality which received a dressing of barn-yard manure about 18 tons per acre in the spring of 1893. No fertilizer of any sort has been applied since. The previous crop was wheat. The land was gang-ploughed shallow in 1898 soon after harvest to start weed seeds and shed grain and ploughed again late in autumn about 8 inches deep. In the spring of 1899 it was disc-harrowed twice and harrowed twice with the smoothing harrow before sowing. The seed of all the varieties was sown on May 2, on plots of one-fortieth acre each, two bushels of seed were used per acre and the land was rolled after sowing, just before the grain came up. Among the varieties tested this year were the following 14 cross-bred sorts all of which have been produced on the Experimental Farms. Lawson, Olive, Oxford, Cromwell, Miller, Kendal, Medal, Milford, Russell, Master, Brandon, Holland, King and Pense.

OATS.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
					Inches.		Inches.		Bush.	Lbs.	Lbs.	
1	Thousand Dollar......	Aug.	4	94	40 to 47	Stiff......	7 to 9½	Branching	74	4	33¼	Considerably.
2	Lawson..............	"	11	101	48 to 54	"	9 to 11	Sided	68	28	31	Badly.
3	Golden Giant.	"	11	101	46 to 50	"	8 to 10	"	68	8	30½	"
4	Holstein Prolific......	"	7	97	44 to 48	"	7¾ to 9½	Branching	67	22	33¼	Slightly.
5	Poland	"	4	94	40 to 43	Medium..	8 to 9½	" ..	67	2	33½	Badly.
6	New Zealand.........	"	15	105	46 to 50	Stiff......	9 to 11	Sided	66	16	38	Slightly.
7	Danish Island.......	"	5	95	40 to 45	"	7½ to 9½	Branching	65	30	31½	"
8	Banner	"	7	97	46 to 50	"	8 to 10	" ..	65	30	30	"
9	American Triumph...	"	7	97	40 to 44	"	6¾ to 8	" ..	65	30	34½	"
10	American Beauty.....	"	7	97	44 to 47	Weak	8 to 10	" ..	64	24	27	Badly.
11	Columbus.......... .	"	5	95	42 to 47	"	7½ to 9	" ..	64	24	30	"
12	White Giant.........	"	7	97	42 to 46	Stiff......	6½ to 8½	" ..	64	24	34	Slightly.
13	Prol. Blk. Tartarian..	"	9	99	46 to 50	Weak	8 to 10	Sided	61	26	28¾	Badly.
14	Mennonite..........	"	7	97	40 to 45	Medium..	7½ to 9	Branching	61	6	33¼	Slightly.
15	Mounted Police......	"	7	97	44 to 48	Stiff......	7½ to 9	" .	61	6	30	Considerably.
16	Abyssinia............	"	7	97	42 to 46	Medium..	7 to 8½	Sided	60	..	35	"
17	Golden Tartarian.....	"	9	99	48 to 52	Stiff......	8 to 10	Sided.....	60	..	30¼	Badly.
18	Joanette............	"	9	99	36 to 40	"	6 to 7¾	Branching	59	14	34	Slightly.
19	Oderbruch...........	"	7	97	40 to 46	Medium..	7½ to 9	Half-sided	59	14	31	Considerably.
20	Lincoln..............	"	7	97	40 to 46	Stiff......	8½ to 10	Branching	58	28	28	"
21	Olive...............	"	8	98	45 to 49	Medium..	7½ to 9	Half-sided	58	8	34	"

OATS.—TEST OF VARIETIES.—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
22	Bavarian	Aug. 7	97	42 to 46	Stiff	7½ to 9	Branching	57	22	30	Slightly.
23	Winter Grey	" 3	93	45 to 48	Medium	7 to 9	"	57	2	39	Considerably.
24	Black Tartarian Imp.	" 9	99	46 to 50	Weak	8 to 10	Sided	55	10	30	Badly.
25	Black Cluster	" 10	100	36 to 40	Stiff	6 to 7¾	Branching	54	24	31½	Slightly.
26	Wallis	" 4	94	38 to 42	"	8 to 9	"	54	..	29	Considerably.
27	Bayonet	" 7	97	43 to 47	Weak	8½ to 10	"	52	32	36½	"
28	Improved Ligowo Imp	" 6	96	46 to 49	Medium	8 to 9½	"	52	32	32¼	Badly.
29	Imp. Ligowo, C.E.F.	" 6	96	46 to 49	"	8 to 9½	"	52	12	33	"
30	Oxford	" 7	97	43 to 47	Stiff	7½ to 9	Half-sided	52	12	35½	Considerably.
31	Wide Awake	" 7	97	46 to 50	Medium	7½ to 9¼	Branching	52	12	25	"
32	Early Maine	" 9	99	45 to 49	"	7½ to 9¾	"	51	26	31	"
33	Victoria Prize	" 4	94	38 to 42	Weak	6½ to 8	"	51	6	40	Slightly.
34	Early Archangel	" 4	94	40 to 46	Medium	8 to 10	"	51	6	35¼	"
35	Cromwell	" 8	98	44 to 50	Stiff	8 to 10	Half-sided	51	6	32	Considerably.
36	White Russian	" 7	97	46 to 49	Weak	8 to 10	Branching	50	20	30	"
37	Early Golden Prolific	" 7	97	44 to 48	Stiff	6 to 8¼	"	50	20	26½	"
38	Early Gothland	" 7	97	46 to 50	"	8 to 9½	Half-sided	50	20	33	"
39	Newmarket	" 7	97	46 to 50	"	7½ to 9	Branching	49	14	26	Slightly.
40	California Prol. Blk. Im	" 7	97	45 to 48	"	7 to 9	Sided	49	14	25½	Badly.
41	Improved American	" 7	97	48 to 52	"	8½ to 10	Branching	49	14	26¾	Slightly.
42	Salines Imp.	" 8	98	46 to 50	"	7½ to 9½	"	48	8	27	Considerably.
43	Golden Beauty	" 6	96	48 to 52	Weak	8 to 10	"	48	8	26	"
44	Hazlett's Seizure	" 7	97	46 to 50	Stiff	8 to 10	"	48	8	29¾	"
45	Liberty	" 8	98	45 to 50	"	8 to 10	"	48	8	28½	"
46	Buckbee's Illinois	" 10	100	46 to 50	"	8 to 10	"	47	22	29	"
47	Flying Scotchman	" 3	93	38 to 43	Weak	8 to 10½	"	47	22	29¾	"
48	Black Beauty	" 7	97	42 to 46	"	6½ to 8½	"	47	2	31½	"
49	Miller	" 7	97	42 to 46	Stiff	7½ to 9½	"	47	2	32¼	"
50	Kendal	" 8	98	45 to 49	Weak	7 to 9	Hlf-br'nch	47	2	28½	"
51	Medal	" 8	98	50 to 54	Stiff	8½ to 10	Half-sided	47	2	29½	Considerably.
52	Siberian	" 8	98	44 to 50	"	8 to 10	Branching	47	2	28	"
53	California Prol. Blk.	" 7	97	43 to 48	Weak	6½ to 8½	Sided	45	30	26	"
54	Rosedale	" 5	95	46 to 50	"	7½ to 9	Half-sided	45	10	28¼	Badly.
55	White Schonen	" 8	98	45 to 50	Medium	7 to 9	Branching	45	10	29	Considerably.
56	Cream Egyptian	" 7	97	46 to 50	Weak	7½ to 9¼	Half-sided	45	10	30	Badly.
57	Milford	" 9	99	44 to 48	Stiff	7 to 9	"	44	24	29	Considerably.
58	White Wonder	" 2	92	40 to 43	Weak	7 to 9	Branching	44	4	39¼	"
59	Russell	" 8	98	40 to 46	"	7½ to 9	Hlf-br'nch	43	18	31	"
60	Victoria	" 8	98	44 to 48	"	8½ to 9½	Branching	43	18	27	Badly.
61	Master	" 9	99	48 to 55	Stiff	9 to 11	Half-sided	43	18	31	"
62	Early Blossom	" 7	97	40 to 44	"	7½ to 9	"	41	26	34½	Slightly.
63	Abundance	" 7	97	46 to 50	Weak	8 to 9½	Branching	41	26	25	Considerably.
64	Scottish Chief	" 2	92	40 to 47	"	6 to 8½	"	41	26	29¼	"
65	Bonanza	" 3	93	40 to 44	"	7½ to 10	"	41	26	32	"
66	Rennie's Prize White	" 9	99	42 to 47	"	7 to 10	"	40	20	29½	"
67	Brandon	" 7	97	40 to 45	"	7½ to 9½	Half-sided	40	20	29	Badly.
68	Holland	" 9	99	42 to 48	Stiff	7 to 8½	Sided	40	..	27½	"
69	Early Dawson	" 3	93	39 to 42	Weak	8 to 10	Branching	39	14	37	Considerably.
70	King	" 7	97	45 to 50	Medium	8 to 9½	"	39	14	29½	"
71	Black Mesdag	" 3	93	38 to 42	Weak	8 to 10	"	38	28	27¼	Badly.
72	Mortgage Lifter	" 4	94	40 to 45	Stiff	7½ to 9	"	38	28	32½	Considerably
73	Coulommiers	" 8	98	45 to 49	"	6¾ to 8	"	35	30	32½	"
74	Welcome	" 2	92	36 to 39	Weak	6 to 8	"	35	10	29	"
75	Pense	" 8	98	40 to 45	Medium	7 to 9	Half-sided	35	10	34½	Badly.
76	Imported Irish	" 2	92	40 to 44	Weak	7 to 9	Branching	34	24	38	Considerably.
77	Prize Cluster	" 4	94	36 to 40	"	6 to 8	"	31	26	32½	"
78	Doncaster Prize	" 9	99	44 to 48	Stiff	7½ to 9½	"	25	10	26¾	"

EXPERIMENTS WITH BARLEY.

Fifty-six varieties of barley have been under trial in the uniform test plots during the past season. Twenty-four of these were two-rowed sorts and thirty-two were six-rowed. The land chosen for the barley plots was adjoining that used for the trial plots of oats. The soil was similar and the preparation and treatment of the land the same. The previous crop was wheat. The two-rowed varieties were all sown on May 1 at the rate of 2 bushels of seed per acre and the six-rowed sorts on May 2, using $1\frac{3}{4}$ bushels of seed per acre. The size of the plots was $\frac{1}{40}$th acre each. Among the varieties tested this year are included the following two-rowed and six-rowed sorts, all of which are hybrids which have been produced at the Experimental Farms. Two-rowed sorts, 17, as follows: Sidney, Beaver, Kirby, Fulton, Leslie, Monck, Nepean, Logan, Dunham, Clifford, Victor, Jarvis, Pacer, Gordon, Bolton, Rigid and Harvey. Six-rowed sorts, 17, namely, Claude, Pioneer, Royal, Nugent, Trooper, Summit, Yale, Vanguard, Stella, Argyle, Mansfield, Garfield, Brome, Phœnix, Empire, Albert and Surprise.

Two-rowed Barley—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs	
1	Sidney	Aug. 3..	94	38 to 41	Medium..	3 to $3\frac{1}{2}$	50	..	50	Slightly.
2	Beaver	" 3..	94	33 to 36	Weak	3 to $4\frac{1}{2}$	49	8	$50\frac{1}{2}$	"
3	French Chevalier	" 4..	95	33 to 37	"	3 to 5	47	24	49	Considerably.
4	Kirby	July 31..	91	34 to 38	"	$2\frac{1}{2}$ to 3	47	4	49	Slightly.
5	Danish Chevalier	Aug. 4..	95	35 to 38	"	$3\frac{1}{2}$ to 5	47	4	49	Considerably.
6	Canadian Thorpe	" 2..	93	37 to 41	Stiff......	3 to 4	46	32	50	Slightly.
7	Fulton	July 29..	89	36 to 39	"	3 to $3\frac{1}{2}$	46	32	$49\frac{1}{2}$	"
8	Leslie	" 29..	89	32 to 35	Weak	3 to $3\frac{1}{2}$	45	40	50	"
9	Monck	Aug. 4..	95	39 to 41	Stiff	$3\frac{1}{2}$ to $4\frac{1}{2}$	45	20	48	"
10	Nepean	July 29..	89	40 to 44	Weak	$2\frac{1}{2}$ to $3\frac{1}{4}$	45	20	$49\frac{1}{4}$	"
11	Logan	" 29..	89	40 to 43	Stiff	$2\frac{1}{2}$ to $3\frac{1}{2}$	45	20	49	"
12	Dunham	" 29..	89	39 to 42	"	3 to $3\frac{1}{2}$	45	..	48	"
13	Clifford	" 29..	89	40 to 44	"	3 to 4	44	28	$51\frac{1}{2}$	"
14	Victor	" 30..	90	37 to 40	Medium..	3 to 4	44	28	$49\frac{1}{2}$	"
15	Jarvis	" 29..	89	40 to 45	Stiff.....	3 to $4\frac{1}{2}$	44	8	51	"
16	Pacer	" 29..	89	37 to 40	"	3 to 4	41	42	$48\frac{1}{2}$	"
17	Gordon	" 29..	89	39 to 42	"	3 to $3\frac{1}{2}$	40	40	$49\frac{3}{4}$	"
18	Bolton	" 29..	89	36 to 39	Medium..	$2\frac{1}{2}$ to 4	38	16	49	"
19	Rigid	" 31..	91	34 to 37	Stiff .. .	3 to 4	36	42	$49\frac{1}{2}$	"
20	Kinver Chevalier	Aug. 7..	98	34 to 38	Weak	3 to $4\frac{1}{2}$	35	20	48	Considerably.
21	Improved Thanet	" 7..	98	35 to 39	"	$3\frac{1}{2}$ to 5	33	16	50	Slightly.
22	Newton	" 7..	98	32 to 36	Stiff......	3 to 4	30	40	52	"
23	Harvey	July 29..	89	36 to 39	"	3 to $4\frac{1}{2}$	30	..	$50\frac{1}{2}$	"
24	Prize Prolific	Aug. 8..	99	36 to 40	Weak	$3\frac{1}{2}$ to $4\frac{3}{4}$	28	36	49	Badly.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Proportion Rusted.
				Inches.		Inches.	Bush.	lbs.	Lbs	
1	Common	July 25	84	32 to 35	Medium	$2\frac{1}{2}$ to 3	52	24	$47\frac{1}{2}$	Slightly.
2	Claude	" 28	87	29 to 32	Weak	$2\frac{1}{4}$ to 3	52	4	$48\frac{1}{4}$	Considerably.
3	Pioneer	" 29	88	35 to 38	Stiff	$2\frac{1}{2}$ to 3	50	40	50	Slightly.
4	Petschora	" 25	84	34 to 38	Weak	$2\frac{1}{2}$ to $3\frac{1}{4}$	50	40	$48\frac{3}{4}$	"
5	Rennie's Improved	" 25	84	35 to 39	"	2 to $2\frac{3}{4}$	50	20	49	"
6	Royal	" 25	84	30 to 33	Stiff	$2\frac{1}{2}$ to 3	50	..	50	"
7	Nugent	" 28	87	33 to 37	"	2 to 3	50	..	$48\frac{1}{2}$	"
8	Trooper	" 26	85	33 to 36	"	2 to $2\frac{3}{4}$	49	8	49	"
9	Oderbruch	" 27	86	34 to 37	"	2 to $2\frac{1}{2}$	49	8	49	"
10	Summit	Aug. 1	91	36 to 39	Medium	$2\frac{1}{2}$ to 3	48	16	50	"
11	Odessa	July 26	85	32 to 35	Stiff	$2\frac{1}{2}$ to 3	47	44	$48\frac{3}{4}$	"
12	Yale	Aug. 1	91	35 to 38	Weak	$2\frac{1}{2}$ to 3	47	24	49	"
13	Vanguard	July 26	85	36 to 39	Stiff	2 to 3	47	4	$48\frac{1}{2}$	"
14	Stella	" 25	84	33 to 36	"	3 to $3\frac{1}{2}$	46	32	50	"
15	Hulless Black	" 26	85	28 to 30	Weak	$1\frac{1}{2}$ to 2	46	32	58	"
16	Argyle	" 28	87	33 to 36	"	$2\frac{1}{4}$ to 3	46	12	$48\frac{1}{2}$	"
17	Blue (Long Head)	" 28	87	34 to 37	"	$2\frac{1}{2}$ to $3\frac{1}{4}$	46	12	$47\frac{1}{2}$	"
18	Mansfield	" 28	87	34 to 37	Stiff	$2\frac{1}{2}$ to $3\frac{1}{4}$	45	20	49	"
19	Mensury	" 29	88	39 to 42	Medium	3 to 4	44	8	$49\frac{1}{2}$	"
20	Garfield	" 28	87	35 to 38	Stiff	$2\frac{1}{2}$ to 3	43	16	48	"
21	Blue (Short Head)	Aug. 8	98	28 to 32	"	$1\frac{1}{2}$ to $2\frac{1}{2}$	42	4	$46\frac{1}{2}$	"
22	Success	July 19	78	36 to 40	"	$2\frac{1}{2}$ to 3	41	32	46	"
23	Brome	Aug. 1	91	33 to 37	"	2 to $2\frac{1}{2}$	41	12	48	"
24	Champion	July 26	85	42 to 45	Medium	$2\frac{1}{2}$ to $3\frac{1}{4}$	40	40	$46\frac{1}{2}$	"
25	Phoenix	" 26	85	37 to 40	Weak	$1\frac{3}{4}$ to $2\frac{1}{4}$	40	..	47	"
26	Monde Hulless	" 20	79	31 to 34	"	2 to $2\frac{1}{2}$	38	36	$61\frac{1}{2}$	"
27	Baxter	" 28	87	36 to 39	Medium	$1\frac{3}{4}$ to $2\frac{1}{4}$	38	16	49	"
28	Excelsior	" 21	80	38 to 42	Stiff	3 to $3\frac{1}{2}$	36	32	47	"
29	Hulless White	" 26	85	30 to 32	Weak	2 to 3	35	40	59	"
30	Empire	" 27	86	33 to 36	"	2 to $2\frac{1}{2}$	34	8	$48\frac{3}{4}$	"
31	Albert	" 29	88	39 to 42	Stiff	2 to 3	34	8	$48\frac{1}{2}$	"
32	Surprise	" 29	88	31 to 44	"	3 to $3\frac{1}{2}$	30	40	48	"

EXPERIMENTS WITH FALL WHEAT.

The number of varieties of fall wheat under trial during the past season was twenty-five. These were all sown in plots of one-fortieth of an acre each on sandy loam soil on September 9, 1898. The winter was very unfavourable for this crop. The ground was bare of snow during portions of the early winter months when the temperature was low. In the spring of 1899 all the plots were found to be so badly winter-killed that they were ploughed under.

EXPERIMENTS WITH SPRING WHEAT.

The number of varieties of spring wheat under trial during the past season was sixty-five. The land used for these tests was also adjoining the oat plots but the soil was somewhat heavier and contained a larger proportion of clay. The preparation and treatment of the land was the same. The previous crop was oats. The size of the plots was one-fortieth of an acre each and all were sown on April 28 and 29, at the rate of $1\frac{1}{2}$ bushels of seed per acre. The land was rolled before the grain came up. The varieties tested this year included the following 41 cross-bred sorts, all of which were originated on the experimental farms : Preston, Laurel, Vernon, Captor, Stanley, Percy, Allen, Rideau, Admiral, Beauty, Progress, Weldon, Crown, Harold, Essex, Huron, Dawson, Blenheim, Cartier, Alpha, Chester, Clyde, Benton, Hastings, Bishop, Countess, Cassel, Fraser, Ebert, Crawford, Angus, Advance, Dufferin, Blair, Mason, Plumper, Early Riga, Dawn, Campbell, Byron and Norval.

SPRING WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	Number of days maturing.	Length of Straw. In.	Character of Straw.	Length of Head. In.	Kind of Head.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel. Lbs.	Proportion Rusted.
Preston	Aug. 4	98	40—43	Stiff	3—3½	Bearded	33	20	61	Slightly.
Wellman's Fife	" 9	102	46—50	"	3½—4¾	Beardless	32	40	60	"
Hungarian	" 5	99	38—42	"	3½—4	Bearded	31	20	62	"
Emporium	" 7	101	44—48	Weak	3½—4½	"	31	..	58½	Considerably.
Roumanian	" 12	106	42—46	Stiff	2½—3½	"	30	40	64	Slightly.
Rio Grande	" 7	101	44—48	Weak	3½—4½	"	29	..	61½	Considerably.
Colorado	" 5	99	40—44	Stiff	2½—3	"	28	20	62½	Slightly.
Laurel	" 8	102	40—44	"	3—4	Beardless	28	20	59	"
Pringle's Champlain	" 7	101	40—43	"	3—4	Bearded	28	..	62	"
Monarch	" 8	102	44—48	"	3½—4½	Beardless	27	..	60	"
White Connell	" 9	103	40—45	"	3—4	"	27	..	61¾	"
White Fife	" 8	102	36—40	"	3—4	"	27	..	61	"
White Russian	" 8	101	44—48	"	3½—4½	"	26	40	59	"
Pride of Baropa	" 9	102	44—48	Weak	2½—3	"	26	40	60½	Considerably.
Vernon	" 4	98	40—44	Stiff	3—3½	Bearded	26	..	60½	"
Captor	" 8	102	45—49	"	3—4	Beardless	25	40	59	Slightly.
Stanley	" 5	99	38—41	"	2½—3½	"	25	20	61¼	"
Red Fern	" 14	108	46—50	"	3½—4½	Bearded	25	20	61	"
Percy	" 7	100	45—49	Medium	3½—4½	Beardless	25	20	60	"
Allen	" 5	99	38—42	Weak	2½—3	"	25	20	60	Badly.
Rideau	" 2	95	38—42	Stiff	2½—4	"	25	20	59	Slightly.
Admiral	" 9	103	40—44	"	2½—3½	"	25	..	61	"
Beauty	" 7	101	40—43	"	3—4½	"	24	40	58	Considerably.
Goose	" 12	106	42—46	"	2½—3½	Bearded	24	20	64	Slightly.
Dion's	" 14	108	46—50	"	3½—4½	"	24	20	61½	"
Progress	" 3	96	38—41	"	2—3	Beardless	24	20	61	"
Weldon	" 9	102	46—50	Medium	2¾—3½	"	24	20	60½	Considerably.
Crown	" 7	101	40—43	Stiff	3—4	Bearded	24	..	60½	Slightly.
Harold	July 26	91	35—38	Weak	2—3	"	24	..	57	Badly.
Essex	Aug. 10	103	45—49	Stiff	3—4	Beardless	24	..	59½	Slightly.
Huron	" 4	98	34—38	"	2½—3	Bearded	23	20	62½	"
Dawson	" 9	102	30—34	Weak	2½—3½	Beardless	23	20	61	"
Blenheim	" 7	101	40—44	Stiff	3—4	Bearded	23	..	60½	"
Cartier	" 6	100	38—42	Weak	2—3½	"	22	40	58	Considerably.
Campbell's W. Chaff	" 9	103	40—43	Stiff	2—3	Beardless	22	40	57½	Slightly.
Ladoga	" 1	95	35—38	"	3—3½	Bearded	22	40	59½	"
Alpha	" 8	101	40—45	"	2½—3½	Beardless	22	40	61	"
Chester	" 6	100	35—40	"	3—3¾	"	22	20	60½	"
Clyde	" 8	102	40—45	"	3½—4¼	"	22	..	60½	"
Benton	" 4	97	40—44	Medium	3—3½	"	21	..	58	"
Hastings	" 3	96	40—43	Stiff	2—3½	"	21	..	61	Considerably.
Bishop	" 2	95	40—43	"	2—3	"	20	40	61	"
Countess	" 3	96	38—42	"	2½—3	"	20	40	61	Slightly.
Cassel	" 8	101	44—48	"	3¼—4	"	20	..	60¾	"
Fraser	" 1	95	39—41	Medium	2—3	Bearded	19	40	57½	Considerably.
Red Swedish	" 5	99	38—42	Weak	2—3½	"	19	20	56	Badly.
Red Fife	" 9	102	40—43	Stiff	3—4	Beardless	18	40	61	Slightly.
Ebert	" 3	96	35—40	Weak	2½—4	"	18	40	58½	Considerably.
Crawford	" 9	102	44—48	Stiff	2½—3½	"	18	20	58½	"
Beaudry	" 7	101	40—43	Weak	2½—3	Bearded	17	20	60½	"
Angus	" 8	101	42—46	Stiff	2½—3½	Beardless	17	20	60¼	Slightly.
Advance	" 7	101	46—50	"	3—3¾	Bearded	17	..	61	"
Dufferin	" 1	95	39—42	Weak	2½—3½	"	16	40	56¾	Considerably.
Blair	" 7	100	40—44	"	2½—3½	Beardless	16	20	60	"
Herisson Bearded	" 7	101	36—40	Stiff	1½—2½	Bearded	16	..	62	"
Black Sea	" 1	95	38—41	"	3—3¼	"	16	..	59½	Slightly.
Mason	" 6	100	40—45	"	2½—3¼	Beardless	16	..	59	Considerably.
Plumper	" 5	99	30—34	Weak	2—3	Bearded	15	..	59½	Badly.
Early Riga	July 29	92	37—40	"	2½—3¼	Beardless	15	..	54	Considerably.
Dawn	Aug. 4	98	30—34	"	1½—2½	"	15	..	57½	"
Campbell	" 8	101	40—45	Stiff	3—3½	"	15	..	56½	"
Byron	" 5	98	34—38	Weak	2½—3½	Bearded	14	40	56	"
Norval	" 7	101	34—37	"	1¾—2¼	"	11	20	58½	"
Golden Drop	" 5	98	33—36	Stiff	2—3	Beardless	9	20	57	"
Gehun	" 1	95	30—33	Weak	1½—2½	Bearded	8	40	56½	"

EXPERIMENTS WITH PEASE.

Sixty varieties of pease were sown on the trial grounds last year on plots of one-fortieth of an acre each. Many of them made good growth and promised fair crops. When most of the plots had been cut and were nearly ready to house, a sudden and violent wind storm arose on the 21st of August, which in a few moments carried the product of a large proportion of the plots to the lower end of the field where they were so mixed that it was impossible to separate them. Under these circumstances no comparisons can be made this year of the yields of the many varieties under trial.

RESULTS OF EARLY, MEDIUM AND LATE SOWINGS.

The tests here recorded which comprise six successive sowings of one week apart were all conducted on similar land on $\frac{1}{20}$th acre plots, the plots adjoining each other. The soil was a sandy loam of fair quality which received a dressing of barn-yard manure, about 12 tons per acre in the autumn of 1895 when it was ploughed under. The land also received an application of unleached wood ashes in November, 1897, of about 125 bushels to the acre. No fertilizers have been applied since. The previous crop was grain in experimental plots, the different kinds of grain being sown in rotation. The land was ploughed very shallow shortly after harvest to start weed seeds, and again later in the autumn about 8 inches deep. In the spring a sufficient quantity of the land for the first set of plots was thoroughly stirred with a two-horse cultivator which loosened the soil about 6 inches deep, and harrowed twice with the smoothing harrow before sowing. The first sowing was made as soon as the land was in fit condition to receive the seed. The oats were sown at the rate of 2 bushels per acre, the Canadian Thorpe barley 2 bushels, the Odessa $1\frac{3}{4}$, the spring wheat $1\frac{1}{2}$ bushels, the Mummy pease $2\frac{1}{2}$ bushels, and the Golden Vine 2 bushels per acre. A sufficient portion of the land for the subsequent sowings was worked up from week to week as it was needed, in the same manner as that for the first set of plots, and in this way any weeds which had started were killed, and each series of plots were given at the outset, the same chance as far as condition of soil was concerned.

OATS AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Yield per Acre.	Weight per Bushel.	Rusted.
				Inches.	Lbs.	Bush. Lbs.	Lbs.	
Banner	April 25	Aug. 5	102	44 to 48	3,290	50 30	....	Very slightly
"	May 2	" 9	99	48 to 50	5,070	66 6	....	" "
"	" 9	" 12	95	38 to 40	3,230	54 14	....	" "
"	" 16	" 16	92	48 to 50	4,620	57 22	....	Badly.
"	" 23	" 18	87	44 to 48	3,440	42 32	....	"
"	" 30	" 22	84	44 to 46	2,530	40 20	....	"
Abundance.......	April 25	Aug. 5	102	44 to 46	2,950	43 8	....	Slightly.
"	May 2	" 7	97	44 to 48	5,070	55 10	....	"
"	" 9	" 10	93	36 to 40	2,760	51 6	....	"
"	" 16	" 15	91	44 to 48	4,420	49 14	....	Badly.
"	" 23	" 16	85	44 to 46	2,560	39 14	....	"
"	" 30	" 20	82	44 to 46	2,410	37 12	....	"

SPRING WHEAT SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Weight of Straw per Acre.	Yield of grain per Acre.		Weight per Bushel.	Rusted.
				Inches.	Lbs.	Bush.	Lbs.		
Red Fife..........	April 25	Aug. 11	108	20 to 24	2,420	8	50	60¼	Badly.
"	May 2	" 19	109	44 to 48	4,610	23	30	59½	Slightly.
"	" 9	" 24	107	44 to 46	3,700	16	10	60	Considerably.
"	" 16	" 25	101	44 to 46	3,860	12	30	58¼	"
"	" 23	" 28	97	40 to 44	2,390	12	10	60	"
"	" 30	" 31	93	30 to 36	2,070	8	10	58¼	Badly.
Stanley..........	April 25	" 9	106	18 to 24	1,730	7	30	60	"
"	May 2	" 16	106	40 to 46	3,380	20	30	59½	Slightly.
"	" 9	" 18	101	40 to 46	3,470	12	30	60	Badly.
"	" 16	" 19	95	40 to 42	3,390	11	10	60	"
"	" 23	" 22	91	38 to 40	2,250	10	10	58¾	Considerably.
"	" 30	" 28	90	30 to 38	2,219	6	50	60¼	Badly.

BARLEY SOWN AT DIFFERENT DATES.

Canadian Thorpe..	April 25	July 29	95	30 to 36	2,350	26	2	50¼	Slightly.
" ...	May 2	Aug. 4	94	36 to 40	4,010	43	6	50	"
" ...	" 9	" 9	92	36 to 40	1,810	28	26	49½	"
" ...	" 16	" 11	87	48 to 52	2,890	34	18	50½	Very slight y.
" ...	" 23	" 15	84	36 to 38	2,230	30	10	49¾	"
" ...	" 30	" 23	83	36 to 38	2,470	29	8	49	Considerably.
Odessa..........	April 25	July 26	92	30 to 39	2,640	23	16	50¼	Slightly.
"	May 2	" 31	90	36 to 39	3,840	47	4	49¾	Very slightly.
"	" 9	Aug. 7	90	32 to 36	1,640	26	12	48½	"
"	" 16	" 9	85	48 to 50	2,770	32	14	48¾	None.
"	" 23	" 12	81	34 to 36	2,150	32	34	47	Very slightly.
"	" 30	" 16	76	32 to 36	2,380	28	26	46	Slightly.

PEASE SOWN AT DIFFERENT DATES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of days Maturing.	Length of Straw.	Weight of Straw per acre.	Yield per Acre.		Weight per Bushel.
				Inches.	Lbs.	Bush.	Lbs.	Lbs.
Mummy....................	April 25..	Aug. 13..	110	48 to 60	3,310	32	40	63¼
"	May 2..	" 16..	106	60 to 66	4,110	34	50	62½
"	" 9..	" 20..	103	52 to 60	4,050	33	30	63¼
"	" 16 .	" 25..	101	52 to 60	3,800	27	30	63¼
"	" 23..	" 27..	96	52 to 60	4,230	23	10	63¼
"	" 30..	Sept. 2..	95	48 to 52	2,310	19	30	63½
Golden Vine....................	April 25..	Aug. 16..	113	60 to 72	4,590	36	10	63
"	May 2..	" 18..	108	66 to 72	4,240	36	40	63¼
"	" 9..	" 22..	105	66 to 72	4,340	33	40	63½
"	" 16..	" 24..	105	60 to 70	3,950	28	50	63½
"	" 23..	" 31..	100	60 to 69	4,190	26	10	63½
"	" 30..	Sept. 5.	98	52 to 60	2,690	20	40	63½

SUMMARY OF RESULTS OF EARLY, MEDIUM AND LATE SOWINGS FOR THE WHOLE PERIOD.

The following are the average crops which have been obtained during the full period these tests have been continued, that is ten years with the oats, barley and spring wheat, and five years with pease :—

Tests Continued for Ten Years.									Tests Continued for Five Years.		
Oats.	Average Yield per Acre.		Barley.	Average Yield per Acre.		Spring Wheat.	Average Yield per Acre.		Pease.	Average Yield per Acre.	
	Bus.	Lbs.		Bus.	Lbs.		Bus.	Lbs.		Bus.	Lbs.
1st Sowing....	53	9	1st Sowing....	38	21	1st Sowing.....	*17	59	1st Sowing....	30	26
2nd "	59	18	2nd "	44	9	2nd "	20	30	2nd "	33	57
3rd "	50	25	3rd "	33	26	3rd "	14	8	3rd "	32	48
4th "	45	32	4th "	31	24	4th "	12	12	4th "	29	56
5th "	40	7	5th "	26	3	5th "	10	18	5th "	26	18
6th "	31	30	6th "	23	35	6th "	8	33	6th "	23	46

* The first sowing of spring wheat in these plots in 1899 was so badly injured by standing water during the extremely wet weather in July that the returns in this connection would be misleading. The figures given in this instance cover only 9 years test.

SUMMARY.

The results of this ten years' trial of early, medium and late sowings of oats, barley and spring wheat should be carefully noted by every farmer in Ontario and Quebec. The experiments have been conducted on a piece of land very uniform in character with the same preparation and treatment and the same seed has been used in each case. There seems no reason to doubt that the results which have been had have been almost wholly due to the period of seeding. They show that the period when the second sowing in these experiments has been made, that is about one week after the ground is in that condition that sowing is practicable, is the most favourable time for the sowing of these crops at Ottawa.

LOSS IN CROP OF OATS BY DELAY IN SOWING.

These experiments show that in the sowing of oats a delay of one week beyond the time spoken of has caused an average loss of over 15 per cent, two weeks a loss of 22 per cent, three weeks a loss of over 32 per cent, and a delay of four weeks has resulted in an average loss of about 48 per cent of the crop.

LOSS IN CROP OF BARLEY BY DELAY IN SOWING.

With barley a delay of one week in sowing beyond the most favourable period shows an average loss of 23 per cent, a delay of two weeks a loss of more than 27 per cent, three weeks about 40 per cent and a delay of four weeks has entailed an average loss of nearly 46 per cent.

LOSS IN CROP OF SPRING WHEAT BY DELAY IN SOWING.

In the case of spring wheat a delay of one week beyond the period which these experiments show to have been most favourable has entailed a loss of over 30 per cent, two weeks fully 40 per cent, three weeks nearly 50 per cent, and a delay in sowing of four weeks beyond the time referred to has involved an average loss of over 56 per cent.

LOSS IN CROP OF PEASE BY DELAY IN SOWING.

The results obtained from the five years' trial of early, medium and late sowings of pease show that about a week after the ground is in that condition to make seeding practicable is the most favourable for this crop. That a delay of one week beyond this

period has caused an average loss of about 4 per cent, a delay of two weeks about 12 per cent, three weeks about 22 per cent, and a delay of four weeks has lessened the crop on an average over 30 per cent.

These experiments have now been continued long enough to demonstrate most conclusively how important it is that farmers should sow all their grain crops promptly and if possible within ten days after the ground,—prepared by ploughing in the autumn,—is ready for seeding. If this practice were to become universal the average crop in these provinces would be very much increased.

EXPERIMENTS WITH INDIAN CORN.

Thirty-three varieties of Indian corn were tested during the season of 1899 side by side on fairly uniform land. The soil was a sandy loam of medium quality which received a dressing of barn-yard manure, about twelve tons to the acre during the winter of 1898-9. This was placed on the frozen land fresh from the barn-yard in small heaps of about one-third of a cart load each and spread and ploughed under in the spring. The previous crop was spring wheat. The land was gang-ploughed shallow shortly after harvest to start weed seeds and shed grain, and ploughed again in the autumn 7 or 8 inches deep. In the spring of 1899, after the manure was ploughed under, it was twice harrowed with the smoothing harrow before sowing. The corn was sown with the seed drill in rows 3 feet apart, and subsequently the plants were thinned so as to leave them from 6 to 8 inches apart in the rows.

The varieties were all sown on May 25, and were cut for ensilage on September 14. The yield per acre has been calculated from the weight of the crop cut from two rows, each 66 feet long.

Indian Corn—Test of Varieties.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre grown in rows.
			Inches.		Sept. 14.	Tons. Lbs.
1	Angel of Midnight	Strong	96 to 108	Leafy	Late milk	25 600
2	Red Cob Ensilage	Very strong.	108 to 120	"	Watery	24 1,720
3	Early Mastodon	"	120 to 132	"	Late milk	24 1,500
4	Extra Early Szekley	Strong	72 to 84	Very leafy	Glazed	22 1,980
5	White Cap Yellow Dent	"	108 to 120	"	Late milk	22 1,320
6	Canada White Flint	"	90 to 102	Leafy	"	22 1,100
7	Sanford	"	84 to 96	"	"	20 700
8	Eureka	"	102 to 114	"	Early milk	20 700
9	Iowa Silver Mine	Very strong.	114 to 126	"	Watery	20 260
10	Champion White Pearl	Strong	96 to 108	Fairly leafy.	Early milk	19 1,600
11	Country Gentleman	"	72 to 84	Leafy	Late milk	19 1,160
12	Selected Leaming	"	120 to 132	"	"	19 610
13	Early Butler	"	108 to 120	"	Doughy	19 500
14	Cloud's Early Yellow	"	108 to 120	"	Late milk	18 1,400
15	Evergreen Sugar	"	108 to 120	"	Early milk	18 960
16	Compton's Early	"	84 to 108	"	Late milk	18 300
17	Iowa Gold Mine	Very strong.	108 to 120	"	Early milk	18 300
18	Giant Prolific Ensilage	"	108 to 120	"	"	17 100
19	Rural Thoroughbred White Flint	Strong	96 to 108	Very leafy	"	16 1,000
20	Mammoth Cuban	"	84 to 96	"	Late milk	15 1,900
21	Pride of the North	"	96 to 108	"	Early milk	15 1,900
22	Pearce's Prolific	"	96 to 108	Fairly leafy.	Late milk	15 800
23	Kendall's Early Giant	Medium	66 to 78	Leafy	Early milk	15 360
24	North Dakota White	Strong	90 to 102	Fairly leafy.	Late milk	15 250
25	Mammoth Eight-rowed Flint	"	84 to 102	Leafy	"	14 1,700
26	Black Mexican	"	84 to 96	"	"	14 600
27	Ruby Mexican	"	84 to 96	"	"	14 270
28	Longfellow	"	96 to 108	"	Glazed	13 1,500
29	King of the Earliest	"	108 to 120	"	Late milk	13 400
30	Extra Early Huron	"	90 to 108	Fairly leafy.	Glazed	12 1,300
31	Early Yellow Long Eared	Weak	60 to 72	"	"	12 1,300
32	Yellow Six Weeks Extra	Medium	72 to 84	"	"	12 200
33	Mitchell's Extra Early	"	60 to 72	"	"	9 1,800

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties of Indian corn were chosen for this test, the Longfellow, Selected Leaming and Champion White Pearl. These were sown in rows at four different distances, namely, 21, 28, 35 and 42 inches apart. The object of the experiment was to gain information as to the weight of crop produced when sown under these different conditions. The soil was a sandy loam of fair quality and the previous crop was wheat. The land was ploughed in 1898, soon after harvest, very shallow to start weed seeds and shed grain, and ploughed again later in the autumn about 7 inches deep. During the winter of 1898-9 barn-yard manure was applied to this land in the proportion of about 12 tons per acre. The manure was taken fresh from the barn-yard, and distributed over the land in small piles of about one-third of a cart load each to avoid fermentation. In the spring of 1899 the manure was spread and ploughed under about 6 inches deep and harrowed twice with the smoothing harrow before sowing. The corn was sown with the seed drill on May 25, and was cut for ensilage on September 14. Four rows were planted in each case, and the yield per acre has been estimated from the weight obtained from the two inside rows, each 66 feet long.

Particulars of the results are given in the following table:—

Name of Variety.	Width of Row.	Character of Growth.	Height when Cut.	Condition when Cut.	Weight per Acre.	
	Inches.		Feet.		Tons.	Lbs.
Longfellow	21	Strong	6 to 7	Early milk	14	294
"	28	"	$6\frac{1}{2}$ " $7\frac{1}{2}$	"	11	654
"	35	Very strong	$6\frac{1}{2}$ " 8	Late milk	13	31
"	42	Strong	7 " 8	"	13	112
Selected Leaming	21	"	7 " 8	Early milk	15	1,302
"	28	"	$7\frac{1}{2}$ " $8\frac{1}{2}$	"	12	346
"	35	Very strong	8 " 9	Late milk	15	1,585
"	42	"	8 " 9	"	14	1,184
Champion White Pearl	21	Medium	7 " 8	Early milk	15	738
" "	28	Strong	8 " 9	"	14	1,140
" "	35	Very strong	$8\frac{1}{2}$ " $9\frac{1}{2}$	Late milk	11	1,771
" "	42	"	9 " 10	"	14	1,760

EXPERIMENTS WITH TURNIPS.

Twenty-five varieties of field turnips were tested during the past season, all sown side by side on similar land. The soil was a sandy loam of medium quality, which was manured during the winter of 1898–9, with about 12 tons of barn-yard manure per acre. The manure was taken fresh from the barn-yard during the winter, and put on the frozen land in small piles of about one-third of a cart load each and spread in the spring, when it was ploughed under about 6 or 7 inches deep and harrowed twice with a smoothing harrow. The land was then made up in drills 2 feet apart, and subsequently rolled with a heavy land roller, which flattened the drills nearly one half, leaving a firm seed bed. The seed was sown at the rate of 3 pounds per acre. Three sowings were made of each variety, the first on May 12, second on May 26, and the third on June 8, and all were pulled on October 14. The yield per acre has been calculated from the weight of roots pulled from one row 66 feet in length.

These turnips were sown in single rows across a field of 400 feet or more in length which gave opportunity for further experiment after the row of 66 feet, used to ascertain the yield on October 14, had been pulled. A portion of these roots were left in the

ground until later, to gain information as to what advantage, if any, arises from leaving turnips in the ground after the middle of October. All the varieties under test were so left until November 3, which allowed twenty-one days for additional growth. The results were as follows :—

TURNIPS.—TEST OF VARIETIES.—YIELD FROM FIRST PULLING, OCTOBER 14.

No.	Name of Variety.	1st Sowing.	2nd Sowing.	1st Sown Plots Pulled.	2nd Sown Plots Pulled.	Yield per Acre, 1st Sowing.		Yield per Acre, 2nd Sowing.		Yield per Acre, 3rd Sowing.	
						Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Purple Top Swede	May 12.	May 26.	Oct. 14.	Oct. 14.	34	1,300	30	1,050	23	695
2	Drummond Purple Top....	" 12.	" 26.	" 14.	" 14.	34	310	21	570	27	450
3	Bangholm Selected..	" 12.	" 26	" 14.	" 14.	33	1,980	26	1,460	26	1,695
4	Skirvings..................	" 12.	" 26.	" 14.	" 14.	33	1,980	30	1,710	26	800
5	Prize Winner..............	" 12.	" 26.	" 14.	" 14.	33	1,980	26	1,790	21	1,895
6	Champion Purple Top......	" 12.	" 26.	" 14.	" 14.	33	1,485	30	720	20	95
7	Champion Purple Top (Vil.)	" 12.	" 26.	" 14.	" 14.	33	1,320	27	1,440	24	730
8	Imperial Swede......... ...	" 12.	" 26.	" 14.	" 14.	33	990	27	120	23	1,685
9	Hardy Goliath	" 12.	" 26.	" 14.	" 14.	33	665	24	510	20	95
10	Jumbo..........	" 12.	" 26.	" 14.	" 14.	33	660	27	110	24	580
11	West Norfolk Red Top	" 12.	" 26.	" 14.	" 14.	33	165	30	720	23	1,190
12	Halewood's Bronze Top....	" 12.	" 26.	" 14.	" 14.	33	165	30	1,050	23	1,190
13	Hall's Westbury	" 12.	" 26.	" 14.	" 14.	33	....	32	680	27	285
14	Mammoth Clyde...........	" 12.	" 26.	" 14.	" 14.	33	....	23	860	24	1,995
15	East Lothian.............	" 12.	" 26.	" 14.	" 14.	32	680	24	510	21	900
16	Shamrock Purple Top......	" 12.	" 26.	" 14.	" 14.	32	680	27	1,020	23	860
17	Perfection Swede..........	" 12.	" 26.	" 14.	" 14.	30	1,380	28	1,760	22	550
18	Prize Purple Top..........	" 12.	" 26.	" 14.	" 14.	30	1,050	24	1,500	21	1,895
19	New Arctic...............	" 12.	" 26.	" 14.	" 14.	30	60	25	820	23	365
20	Marquis of Lorne..........	" 12.	" 26.	" 14.	" 14.	29	1,400	22	880	18	960
21	Carter's Elephant..........	" 12.	" 26.	" 14.	" 14.	26	690	24	1,500	18	85
22	Oval.....................	" 12.	" 26.	" 14.	" 14.	24	840	21	900	21	1,065
23	Giant King................	" 12.	" 26.	" 14.	" 14.	21	1,890	21	900	20	1,250
24	Sutton's Champion	" 12.	" 26.	" 14.	" 14.	21	1,130	18	1,950	19	1,105
25	Hartley's Bronze..........	" 12.	" 26.	" 14.	" 14.	18	630	19	1,600	26	800
	Average of the several sowings.	....	....	......	....	30	1,097	25	1,133	22	1,968

The average crops from the earliest sown plots have been much larger than the crops from those later sown. The average from the first sowing has exceeded that from the second sowing by 4 tons 1,964 pounds per acre, and the average crops from the first have exceeded those from the third sowing by 7 tons 1,029 pounds per acre. The average results from the second sowing are larger than those from the third sowing by 2 tons 1,165 pounds per acre.

YIELD OF TURNIPS PER ACRE FROM SECOND PULLING, NOVEMBER, 3.

No.	Name of Variety.	Yield per Acre from 1st Sowing, Second pulling November 3.		Yield per Acre from 2nd Sowing, Second pulling November 3.		Yield per Acre from 3rd Sowing, Second pulling November 3.	
		Tons	Lbs.	Tons	Lbs.	Tons	Lbs.
1	Purple Top Swede	35	620	31	700	23	1,190
2	Drummond Purple Top	34	1,630	22	1,210	30	720
3	Bangholm Selected	35	1,940	27	1,440	28	100
4	Skirving's	34	1,960	32	1,670	26	1,460
5	Prize Winner	34	970	27	450	22	715
6	Champion Purple Top	34	1,300	31	40	24	1,665
7	Champion Purple Top (Vil)	35	950	29	740	25	325
8	Imperial Swede	34	1,300	28	100	24	1,665
9	Hardy Goliath	34	1,960	25	1,150	22	880
10	Jumbo	33	1,650	29	1,400	26	1,130
11	West Norfolk Red Top	33	1,320	30	1,710	23	1,850
12	Halewood's Bronze Top	33	1,320	31	40	24	1,170
13	Hall's Westbury	34	970	32	680	27	1,605
14	Mammoth Clyde	33	1,980	25	160	25	1,480
15	East Lothian	33	660	26	800	23	365
16	Shamrock Purple Top	23	860	28	100	23	1,685
17	Perfection Swede	30	1,380	28	1,420	23	530
18	Prize Purple Top	31	370	25	820	22	220
19	New Arctic	26	470	26	800	24	25
20	Marquis of Lorne	30	1,380	23	200	19	940
21	Carter's Elephant	26	1,330	29	80	18	1,620
22	Monarch	24	1,500	22	550	22	880
23	Giant King	28	430	22	1,540	21	1,065
24	Sutton's Champion	22	550	20	920	20	1,580
25	Hartley's Bronze Top	22	1,210	22	870	27	1,440
	Average yield of the several sowings when pulled late (Nov. 3)	32	4	27	383	24	812

By comparing the average crops here given with those given in the preceding table it will be seen that the turnips gained in weight during the twenty-one days additional time given them as follows :

	Tons.	Lbs.
1st Sowing average gain per acre	1	1,907
2nd " " "	1	1,250
3rd " " "	1	844

An average gain on the three sowings of all the varieties tested of 1 ton 1,333 pounds per acre.

EXPERIMENTS WITH MANGELS.

During the year 1899, twenty-one varieties of mangels were under test. These were all sown side by side adjoining the turnips. The land was similar and the treatment and preparation was the same. The previous crop was barley. The drills were made up 2 feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made, the first on May 11, and the second on May 25. The roots were all pulled on October 13, and the yield per acre has been calculated from the weight of roots gathered from one row 66 feet long.

MANGELS—TEST OF VARIETIES.

No.	Name of Variety.	Date of Sowing. 1st Sowing, May 11.	Date of Sowing. 2nd Sowing, May 25.	Date of Pulling. 1st Sown Plots, Oct. 13.	Date of Pulling. 2nd Sown Plots, Oct. 13.	Yield from 1st Sowing. Tons.	Yield from 1st Sowing. Lbs.	Yield from 2nd Sowing. Tons.	Yield from 2nd Sowing. Lbs.
1	Gate Post					34	640	22	880
2	Mammoth Long Red					33	1,980	21	405
3	Canadian Giant					33	330	21	1,890
4	Prize Mammoth Long Red					33	330	20	260
5	Selected Mammoth Long Red					33	330	18	300
6	Giant Yellow Globe					32	350	21	75
7	Yellow Intermediate					31	370	18	1,620
8	Ward's Large Oval Shaped					30	1,050	14	1,205
9	Lion Yellow Intermediate					30	60	19	1,765
10	Giant Yellow Intermediate					29	1,565	20	260
11	Giant Yellow Half Long					29	1,400	19	610
12	Champion Yellow Globe					27	1,450	16	1,660
13	Mammoth Yellow Intermediate					25	1,315	16	1,010
14	Gate Post Yellow					25	820	14	215
15	Mammoth Oval Shaped					25	160	13	1,940
16	Warden Orange Globe					23	230	11	1,265
17	Norbitan Giant					23	200	15	360
18	Champion Yellow Globe					21	625	18	630
19	Yellow Fleshed Tankard					20	1,250	15	695
20	Golden Fleshed Tankard					19	1,600	15	1,680
21	Red Fleshed Tankard					18	740	14	50
	Average of difierent sowings.					29	139	18	933

The average crop of the first sowing exceeded that from the second sowing by 10 tons, 1,206 pounds per acre.

EXPERIMENTS WITH CARROTS.

Twenty varieties of carrots were under trial during 1899, all sown side by side adjoining the turnips and mangels. The land was similar and the treatment and preparation was the same. The previous crop was pease. Drills were made up 2 feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made, the first on May 11, and the second on May 25. The roots were all pulled on October 13, and the yield per acre has been calculated from the weight of roots gathered from one row 66 feet long.

CARROTS—TEST OF VARIETIES.

No.	Name of Variety.	Date of Sowing. 1st Sowing, May 11.	Date of Sowing. 2nd Sowing, May 25.	Date of Pulling. 1st Sown Plots, Oct. 13.	Date of Pulling. 2nd Sown Plots, Oct. 13.	Yield from 1st Sowing. Tons. Lbs.	Yield from 2nd Sowing. Tons. Lbs.
1	Iverson's Champion	....	....	....	....	33 660	33 ....
2	Giant White Vosges	....	....	....	....	33 330	24 1,500
3	Improved Short White	....	....	....	....	33 ..	31 700
4	Mammoth White Intermediate	....	....	....	....	32 1,340	32 20
5	New White Intermediate	....	....	....	....	32 680	28 1,420
6	Green Top White Orthe	....	....	....	....	28 1,750	24 1,830
7	Long Yellow Stump-rooted	....	....	....	....	28 1,420	27 450
8	Ontario Champion	....	....	....	....	28 1,090	22 880
9	White Belgian	....	....	....	....	28 760	24 510
10	Half Long White	....	....	....	....	27 1,770	22 550
11	Guerande or Ox Heart	....	....	....	....	26 1,955	25 1,150
12	Early Gem	....	....	....	....	25 820	20 920
13	Half Long Chantenay	....	....	....	....	25 820	20 590
14	Yellow Intermediate	....	....	....	....	24 1,170	23 1,190
15	White Large Short Vosges	....	....	....	....	22 385	20 1,250
16	Scarlet Intermediate	....	....	....	....	19 940	15 360
17	Carter's Orange Giant	....	....	....	....	18 1,950	18 300
18	Long Orange or Surrey	....	....	....	....	17 1,310	16 1,990
19	Scarlet Nantes	....	....	....	....	16 1,000	12 1,245
20	Long Scarlet Altringham	....	....	....	....	14 380	13 70
	Average of different sowings	....	....	....	....	24 1,358	21 1,567

The average crop of the first sowing exceeded that from the second sowing by 2 tons 1,791 pounds per acre.

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were tested in 1899. These were sown side by side on land adjoining that used for the trial plots of turnips, mangels and carrots. The soil was similar and the treatment preparation and method of sowing was the same. The previous crop was pease. Two sowings were made, the first on May 11, the second on May 25. The roots were all pulled on October 13, and the yield per acre has been calculated from the weight of roots gathered from one row 66 feet long.

SUGAR BEETS.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of 1st Sowing, May 11.	Date of 2nd Sowing, May 25.	Date of pulling 1st Sown plots, Oct. 13.	Date of pulling 2nd Sown plots, Oct. 13.	Yield from 1st Sowing. Tons. Lbs.	Yield from 2nd Sowing. Tons. Lbs.
1	Wanzleben	....	....	....	....	28 1,585	18 1,950
2	Improved Imperial	....	....	....	....	27 450	18 1,950
3	Vilmorin's Improved	....	....	....	....	26 800	15 690
4	Danish Improved	....	....	....	....	21 1,230	16 1,990
5	Danish Red Top	....	....	....	....	19 1,270	19 1,270
6	Red Top Sugar	....	....	....	....	18 1,290	16 1,660
	Average of different sowings	....	....	....	....	23 1,437	17 1,585

The average crop of the first sowing exceeded that of the second sowing by 5 tons 1,852 pounds per acre.

(POTATOES.)

The records of the results of the experiments with potatoes will be found in the report of the Horticulturist.

EXPERIMENTS WITH CLOVER.

Additional information has been gathered during the past year as to the benefit resulting to land from the ploughing under of green clover. The experience gained with crops grown on land so treated has shown that there is an increase in vigour of growth as well as a material addition to the weight of crop produced.

RESULTS OF SOWINGS OF OATS AFTER CLOVER.

Early in the spring of 1899 a field of four acres of land was ploughed about 4 inches deep. The soil was a sandy loam of medium quality, on two acres of this land barley had been grown in the spring of 1898 and with it 10 pounds of red clover seed had been sown. After the grain was harvested the clover made a rapid growth and before winter set in it had formed a good mat of foliage about a foot high. One acre had been in Brome grass, *Bromus inermis*, in 1898 ; half an acre had been sown with a mixture of pasture grasses without clover and another half acre with a mixture of pasture grasses associated with a good proportion of clover.

After ploughing and harrowing, the whole area of four acres was sown with one variety of oats—the Bavarian. Where clover had been ploughed under its effect was very clearly shown on the growth of the oats, the crop grown after clover was much greener in colour and more vigorous in growth of both leaf and stalk and when measured about the time the heads of grain were shooting out, the plants on an average were about a foot taller than the oats on the adjoining land where no clover had been used.

When harvested the results were as follows :—

	Per acre Bush.	Lbs.
1 acre of oats sown after Brome grass gave	33	8
½ acre after mixture of pasture grasses without clover......	36	16
½ acre after mixture of pasture grasses with clover........	46	4
2 acres sown after barley with clover....................	43	28

The average of the crop sown where no clover had been used was 34 bushels 10 pounds per acre, the average of that sown after clover was 44 bushels 10 pounds, a difference of ten bushels per acre in favour of the crops grown after the ploughing under of clover.

EFFECT OF CLOVER ON CROPS THE SECOND YEAR AFTER PLOUGHING UNDER.

In the Annual Report of the Experimental Farms for 1898, page 45, the results were given of the crops of Banner oats grown on eight plots of one-twentieth of an acre each which had been sown with grain in 1897 ; on four of these the grain had been grown that year with clover and on the other four plots the grain had been grown without clover. The results had in 1898 shewn a considerable increase in the weight of straw harvested and an average increase in yield of grain on the plots where clover had been used of a little over 11 bushels per acre.

In 1899 these plots were all sown with one variety of barley, the Mensuary, and again we find marked differences in favour of the land treated with clover. No other fertilizer has been used.

Plots.	1898. — Straw, yield per Acre.	1898. — Oats, yield per Acre.		1899. — Straw, yield per Acre.	1899. — Barley, yield per Acre.	
	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.
Plot 1—On which Preston wheat was sown in 1897 with clover	3,770	56	6	3,120	40	20
Plot 2—Sown with Preston wheat in 1897 without clover.....	2,160	37	2	1,740	25	20
Plot 3—On which Odessa barley (six-rowed) was sown in 1897 with clover....	2,180	37	12	2,620	32	24
Plot 4—Sown with Odessa barley (six-rowed) in 1897 without clover....	1,450	30	10	2,440	27	44
Plot 5—On which Bolton barley (two-rowed) was sown in 1897 with clover....	3,180	51	26	2,470	33	26
Plot 6—Sown with Bolton barley (two-rowed) in 1897 without clover....	2,090	44	24	2,000	29	28
Plot 7—On which Banner oats was sown in 1897 with clover.	5,110	55	..	3,270	44	38
Plot 8—Sown with Banner oats in 1897 without clover......	2,260	44	4	2,320	33	36

INCREASE IN YIELD OF STRAW BY THE PLOUGHING UNDER OF GREEN CLOVER.

These figures show that the average yield of straw from the four plots treated with clover was for the first year 3,560 pounds per acre and for the second year 2,870 pounds, whereas the weight of straw obtained from the adjoining plots where no clover was used was 1,990 pounds per acre in 1898, and 2,125 pounds per acre in 1899. This shows a larger yield of straw where clover was used of 1,570 pounds per acre the first year and 745 pounds the second year.

INCREASE IN YIELD OF GRAIN BY THE PLOUGHING UNDER OF GREEN CLOVER.

The average increase in grain after the ploughing under of green clover was for the first year when oats were used, 11 bushels 1 pound per acre, and in 1899, when these same plots were sown with barley the average increase was 8 bushels 31 pounds per acre.

These results are indeed remarkable. They show that in the case of the plots under consideration that the ploughing under of a single crop of clover, sown with the grain in 1897, produced a wonderful increase both in straw and grain. From the added fertility and humus thus supplied the crop of straw, when compared with the adjoining plots on which no clover was used, was increased 78 per cent in 1898 and 35 per cent in 1899. The increase in the crop of grain was still more remarkable, since it shows a slightly higher percentage for the second year than it did for the first. The increase in the weight of grain on the plots treated with clover were in 1898 over 28 per cent whereas in 1899, they were over 29 per cent,

INCREASE IN YIELD OF POTATOES BY THE PLOUGHING UNDER OF GREEN CLOVER.

In the spring of 1899 a piece of rather light sandy loam of fair quality, was planted with potatoes of the variety known as Daisy. Nine rows of these were planted 560 feet long and 2½ feet apart on land on which barley had been grown the previous year. Common red clover had been sown with the barley in the propertion of 10 pounds of seed per acre. After the grain was cut, the clover made a rapid growth and had formed a good mat of foliage about 12 inches high by the middle of October, when it was

ploughed under about 7 or 8 inches deep. On land adjoining of the same quality and which had received similar cultivation, nine rows of the same variety of potatoes were planted on the same day. The previous crop on this latter piece of land had been on about ¾th of it pease and the other ¼th carrots.

The potatoes were planted on May 25, came up June 12, and were dug October 3,

On plot 1—Following barley, with clover turned under in October, 1898, the potatoes gave a total yield of 4,208 pounds.

On plot 2—Following pease and carrots, where no clover had been sown, the total yield was 3,025 pounds.

These results show a difference in favour of the crop where clover was used of about 28 per cent. The foliage of the potatoes grown after clover was much more vigorous and even, and was of a deeper green colour.

EXPERIMENTS WITH SOJA BEANS.

(Soja hispida.)

Experiments have been conducted in the growing of an early ripening variety of Soja beans for fodder purposes for the past three years, with the object of finding out the best time to plant and the most successful method of planting. Four plots of one-fortieth acre each were used for this purpose. The soil was a sandy loam of medium quality but somewhat variable. The previous crop was pease. The land was gang-ploughed soon after harvest and ploughed again later in the autumn about 7 inches deep. In the spring of 1899 it received a dressing of barn-yard manure, about 12 tons per acre. This was spread and ploughed under about 6 inches deep and harrowed twice with the smoothing harrow before sowing.

The beans were sown with the seed drill in rows 14, 21, 28 and 35 inches apart and cultivated twice during the season with a horse cultivator. They were all sown on May 31, and were cut for ensilage on September 15.

Plot 1. Sown in rows 14 inches apart. Growth strong and even, very leafy, average height 38 to 40 inches. The pods were just forming at the time the crop was cut. Yield of green fodder, 12 tons 800 pounds per acre.

Plot 2. Sown in rows 21 inches apart. Growth strong and even, very leafy, average height 40 to 44 inches. The pods were well formed, but the beans were still soft when the crop was cut. Yield of green fodder, 12 tons 1,600 pounds per acre.

Plot 3. Sown in rows 28 inches apart. The growth on this plot was medium but even; the weaker growth and smaller yield of this plot and the next was partly due to the soil being lighter. The plants were fairly leafy, and their height was from 40 to 44 inches. The pods were well formed at the time of cutting, and the beans of full size and beginning to harden. Yield of green fodder, 5 tons 1,600 pounds per acre.

Plot 4. Sown in rows 35 inches apart. Growth medium and even, fairly leafy; height, 40 to 44 inches. The plants were well podded, pods more numerous than on those plants in plot 3. The beans were beginning to harden at the time of cutting. Yield of green fodder, 4 tons 1,200 pounds per acre.

EXPERIMENTS WITH HORSE BEANS.

(Faba vulgaris var equina).

Four plots of one-fortieth acre each were devoted to experiments with this crop. The land was adjoining that used for the Soja beans. It was similar in character and quality, and received the same treatment and preparation. The previous crop was

pease. Imported seed was used, of the variety known as Tick beans. The object of this experiment was to gain information as to the crops obtainable from sowings made in rows at different distances apart. The beans were sown with the seed drill in rows 14, 21, 28 and 35 inches apart. All the plots were sown on May 17, and the crop was cut for ensilage on September 15. There was no blight on the plants this year.

Plot 1. Sown in rows 14 inches apart. The growth was medium to strong and even; height, 50 to 55 inches; length of pod, 2 to 2½ inches; plants well podded and beans nearly ripe at time of cutting, yield, 10 tons 1,880 pounds per acre.

Plot 2. Sown in rows 21 inches apart. Growth strong and even; height, 50 to 55 inches. Plants all well podded. Length of pods, 2 to 2½ inches; yield, 12 tons 1,640 pounds per acre.

Plot 3. Sown in rows 28 inches apart. Growth strong and even; height, 50 to 55 inches. Most of the beans on the plants on this plot were ripe at the time of cutting. Yield per acre, 5 tons 600 pounds.

Plot 4. Sown in rows 35 inches apart. Growth medium but even; height, 46 to 51 inches. The crop on this plot was well ripened, and the plants had lost much in weight by drying before it was cut. Yield per acre, 3 tons 1,200 pounds.

EXPERIMENTS WITH MILLETS.

Seven varieties were sown on plots of one-fortieth acre each; all were sown in drills 7 inches apart except the Japanese millet, which was sown in rows 9 inches apart. The soil was a sandy loam of medium quality; the previous crop was pease. The land received a dressing of barn-yard manure in the fall of 1898, which was spread out of the wagon and ploughed under to the the depth of 6 or 7 inches. In the spring of 1899, the ground was harrowed twice with the disc harrow and twice with the smoothing harrow before sowing. The seed was sown with a Planet Junior seed drill and all were sown on May 27.

	Name of Variety.	Date Cut.	Length of Straw in inches.	Character of Growth.	Weight, per acre, green.		Weight, per acre, dry.	
					Tons.	Lbs.	Tons.	Lbs.
1	Pearl	Sept. 13..	60·72	Very strong.	17	..	9	1,000
2	Japanese	Aug. 26..	65·72	" ..	17	1,600	9	800
3	Algerian	" 26..	60·70	" ..	14	400	8	800
4	White Round Extra French	" 25..	55·60	Strong	12	400	5	400
5	Italian or Indian	Sept. 13..	60·66	"	11	1,440	5	400
6	Moha Hungarian	Aug. 28..	46·50	"	7	640	4	1,200
7	Siberian	" 28..	44·48	"	8	800	4	760

These were all cut when the seed was in the soft or doughy stage.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn, and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued; and as explanatory regarding the preparations made and the general plan, together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893 :—

'A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded 6 inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles, on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping.

'The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. It was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn, and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890.' In all cases the plots in each series have been sown on the same day.

'In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also on the half of the barley plots cropped with sugar beets that year." In 1894, 1895, 1896, 1897 and 1898 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

TREATMENT OF SOIL.

"The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again later, about 7 inches deep. In spring the plots have been gang-ploughed once before applying the fertilizers, which are then scattered over the surface and harrowed with the smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and just before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions.'

A summary of these permanent fertilizer plots is given each year, taking the average yield of the whole previous period, adding the results of the current year, and then giving the average yield for the full time.

CHANGES MADE IN THE EXPERIMENTS.

After ten or eleven years of constant cropping it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened and the conditions for plant growth apart from the question of plant food had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring 10 pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats, all of which occupied the full one-tenth acre plots. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth and by October there was a thick mat of foliage varying in height and density on the different plots which was ploughed under October 12.

Ten years' experience had shown that the finely-ground untreated mineral phosphate was of no value as a fertilizer. This substance had been used every year in each series of tests on plots 4, 5, 6, 7 and 8 excepting in the experiments on roots, where it was used on plots 4, 5, 6 and 7. On all these plots the use of the finely-ground untreated mineral phosphate was discontinned in 1898, when there was used in its place similar weights of the Thomas' Phosphate Powder. In 1899 the Thomas' Phosphate Powder was again used on all these plots excepting No. 6 in each series.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series. The growing of carrots and potatoes on one-half of the cereal plots was discontinued, and each plot of the wheat, barley and oats occupied the full tenth acre.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of $1\frac{1}{2}$ bushels per acre, excepting in 1894; and the varieties used were as follows: In 1888–89–90 and 1891 White Russian, and in 1892–3 Campbell's White Chaff. In 1894 the Rio Grande wheat was used, and shortly before sowing, it was tested as to vitality and found to be deficient in germinating power,—less than half the kernels sprouted. As it was not practicable then to secure better seed, double the usual quantity was sown, namely, 3 bushels per acre, which gave a proportion of growth on each plot of about the usual thickness. In 1895, 1896, 1897, 1898 and 1899, Red Fife wheat was used in the usual quantity of $1\frac{1}{2}$ bushels per acre. In 1899 the Red Fife was sown May 5, came up May 13, and was ripe from August 17 to 20.

The season of 1899 was moderately favourable for the growing of spring wheat at Ottawa and has given in most instances crops above the average.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eleven Years. Yield of Grain. Per acre. Bush.	lbs.	Average Yield for Eleven Years. Yield of Straw. Per acre. Lbs.	12th Season, 1899. Variety, Red Fife. Yield of Grain. Per acre. Bush.	lbs.	12th Season, 1899. Yield of Straw. Per acre. Lbs.	Average Yield for Twelve Years. Yield of Grain. Per acre. Bush.	lbs.	Average Yield for Twelve Years. Yield of Straw. Per acre. Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after until 1899—no manure was used that season...	20	$56\frac{4}{11}$	3,709	23	40	5,280	21	10	3,839
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after until 1899—no manure was used that season.......	20	$52\frac{4}{11}$	3,699	27	40	5,910	21	$26\frac{4}{12}$	3,883
3	Unmanured......	10	$16\frac{4}{11}$	1,899	10	35	1,300	10	$17\frac{11}{12}$	1,849
4	Thomas' phosphate, 500 lbs. per acre.....	10	$22\frac{3}{11}$	1,920	10	30	2,470	10	$22\frac{11}{12}$	1,965
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre..................	12	$32\frac{8}{11}$	2,865	12	20	2,590	12	$31\frac{8}{12}$	2,842
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed, and allowed to heat for several days before using, applied each year until 1899, no manure or phosphate were used that season*.............................	18	$11\frac{7}{11}$	3,094	21	10	4,445	18	$26\frac{6}{12}$	3,206
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre......................	12	$43\frac{3}{11}$	2,235	12	50	3,880	12	$43\frac{10}{12}$	2,372
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...........	10	$41\frac{7}{11}$	1,867	10	50	3,260	10	$42\frac{4}{12}$	1,980
9	Mineral superphosphate, No. 1, 500 lbs. per acre................................	11	$37\frac{1}{11}$	1,776	11	30	2,175	11	$36\frac{6}{12}$	1,809
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre........	12	$51\frac{9}{11}$	3,035	14	5	3,110	12	$57\frac{11}{12}$	3,041
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre............	13	$30\frac{10}{11}$	2,665	18	30	3,840	13	$55\frac{10}{12}$	2,736
12	Unmanured................................	9	$43\frac{7}{11}$	1,650	9	5	2,685	9	$40\frac{5}{12}$	1,742
13	Bone finely ground, 500 lbs. per acre . ..	11	$40\frac{3}{11}$	1,834	12	15	2,635	11	43[illegible]	1,900
14	Bone finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.............	15	$12\frac{3}{11}$	2,274	14	35	3,315	15	$9\frac{2}{12}$	2,360
15	Nitrate of soda, 200 lbs. per acre..........	13	$22\frac{3}{11}$	2,300	12	30	2,550	13	$17\frac{11}{12}$	2,320
16	Muriate of potash, 150 lbs. per acre........	15	$20\frac{3}{11}$	2,001	15	10	2,800	15	$19\frac{5}{12}$	2,067
17	Sulphate of ammonia, 300 lbs. per acre....	11	$44\frac{8}{11}$	2,277	15	50	2,940	12	$5\frac{2}{12}$	2,332
18	Sulphate of iron, 60 lbs. per acre........ .	12	$31\frac{4}{11}$	1,840	11	30	1,690	12	$26\frac{3}{12}$	1,881
19	Common salt (Sodium chloride) 300 lbs. per acre	13	15	1,639	14	20	1,810	13	$20\frac{5}{12}$	1,486
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre......................	12	$35\frac{5}{11}$	1,880	11	30	1,880	12	30	1,880
21	Unmanured in 1889, mineral superphosphate, No. 2, 500 lbs. per acre, each year since..	12	$26\frac{2}{11}$	1,850	13	50	2,400	12	$33\frac{2}{12}$	1,895

*Finely ground mineral phosphate was used on this plot from 1888 to 1897. Thomas' phosphate in 1898 only.

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897, 1898 and

1899. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894, 1895, 1896, 1897, 1898 and 1899, Canadian Thorpe, a selected form of the Duck-bill. In 1899 the Canadian Thorpe was sown on May 5, came up May 13 and was harvested on August 7 and 8.

In 1899 the yields of eleven of the barley plots were above the average of past seasons, the others were below the average.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of plot.	Fertilizers applied each Year.	Average Yield for Ten Years.			11th Season, 1899. Variety, Canadian Thorpe.			Average Yield for Eleven Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year until 1899; no manure was used that season....	34	$34\frac{7}{10}$	3,054	34	43	2,835	34	$35\frac{5}{11}$	3,034
2	Barn-yard manure, fresh, 15 tons per acre, each year until 1899; no manure was used that season....	35	$21\frac{1}{10}$	3,280	33	46	3,060	35	$14\frac{7}{11}$	3,260
3	Unmanured....	13	$32\frac{5}{10}$	1,594	10	40	1,075	13	$20\frac{1}{11}$	1,546
4	Thomas' phosphate, 500 lbs. per acre....	13	$42\frac{3}{10}$	1,470	15	..	1,185	13	$47\frac{2}{11}$	1,444
5	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs. per acre....	19	$8\frac{7}{10}$	2,159	25	20	2,970	19	$35\frac{10}{11}$	2,232
6	Barn-yard manure, partly rotted, and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year until 1899; no manure or phosphate was used that season*....	28	$4\frac{7}{10}$	2,439	26	7	2,055	27	$44\frac{2}{11}$	2,404
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre....	22	$26\frac{3}{10}$	2,350	35	15	2,810	23	34	2,391
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	19	$16\frac{5}{10}$	1,676	21	27	1,815	19	$26\frac{2}{11}$	1,688
9	Mineral superphosphate, No. 1, 500 lbs. per acre....	21	9	1,974	16	12	1,120	20	$35\frac{5}{11}$	1,871
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre....	26	$21\frac{5}{10}$	2,383	33	1	2,235	27	$2\frac{2}{11}$	2,369
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	25	$33\frac{5}{10}$	2,533	30	45	2,350	26	$8\frac{4}{11}$	2,516
12	Unmanured....	13	$13\frac{5}{10}$	1,226	10	20	1,070	13	1	1,211
13	Bone, finely ground, 500 lbs. per acre....	13	35	1,380	13	16	1,330	13	$33\frac{3}{11}$	1,375
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre....	22	$1\frac{5}{10}$	1,986	26	2	2,250	22	19	2,010
15	Nitrate of soda, 200 lbs. per acre....	21	22	2,365	24	43	1,970	21	37	2,329
16	Muriate of potash, 150 lbs. per acre....	21	42	1,876	23	46	1,445	22	$3\frac{1}{11}$	1,836
17	Sulphate of ammonia, 300 lbs. per acre....	17	$28\frac{5}{10}$	2,003	24	33	1,835	18	$11\frac{5}{11}$	1,987
18	Sulphate of iron, 60 lbs. per acre....	17	$35\frac{5}{10}$	1,732	17	24	1,400	17	$34\frac{5}{11}$	1,741
19	Common salt (Sodium chloride) 300 lbs. per acre....	28	5	2,114	26	7	1,475	27	$44\frac{5}{11}$	2,056
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre....	19	$39\frac{5}{10}$	1,691	15	40	1,045	19	$22\frac{1}{11}$	1,632
21	Mineral superphosphate, No. 2, 500 lbs. per acre....	20	26	1,860	16	17	1,485	20	$7\frac{8}{11}$	1,826

*Finely ground mineral phosphate was used on this plot from 1888 to 1897. Thomas' phosphate in 1898 only.

OAT PLOTS.

The quantity of seed sown per acre on the oat plots, was 2 bushels in 1889 and 1890; $1\frac{1}{2}$ bushels in 1891, 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897, 1898 and 1899. The varieties used were as follows: In 1889, Early English; in 1890, 1891, 1892, 1893, Prize Cluster; and in 1894, 1895, 1896 1897, 1898 and 1899, Banner. In 1899 the Banner was sown May 8, came up May 14, and the plots were harvested from the 8th to 11th of August. The season of 1899 was favourable for the oat crop, and in most instances the return has been above the average.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Ten Years. Yield of Grain. Per acre.		Average Yield for Ten Years. Yield of Straw. Per acre	11th Season, 1899. Variety, Banner. Yield of Grain. Per acre.		11th Season, 1899. Variety, Banner. Yield of Straw. Per acre	Average Yield for Eleven Years. Yield of Grain. Per acre.		Average Yield for Eleven Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year until 1899; no manure was used that season	48	14	3,235	55	30	2,150	49	$3\frac{1}{11}$	3,136
2	Barn-yard manure, fresh, 15 tons per acre each year until 1899; no manure was used that season	54	17	3,467	55	15	2,135	54	$18\frac{6}{11}$	3,345
3	Unmanured	30	$23\frac{5}{10}$	1,534	29	24	990	30	$20\frac{5}{11}$	1,484
4	Thomas' phosphate, 500 lbs. per acre	30	$18\frac{3}{10}$	1,762	31	11	985	30	$23\frac{3}{11}$	1,691
5	Thomas' phosphate, 500 lbs., nitrate of soda, 200 lbs. per acre	48	7	2,713	52	27	2,785	48	$21\frac{2}{11}$	2,719
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year until 1899; no manure or phosphate was used that season*	44	9	2,614	52	32	2,120	45	$1\frac{9}{11}$	2,569
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	44	$30\frac{5}{10}$	3,149	58	18	3,290	46	$9\frac{5}{11}$	3,161
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	39	$28\frac{5}{10}$	2,299	42	32	2,040	40	$8\frac{2}{11}$	2,275
9	Mineral superphosphate, No. 1, 500 lbs. per acre	35	$\frac{5}{10}$	1,947	35	5	1,855	35	$\frac{10}{11}$	1,938
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre	46	1	2,812	52	17	2,375	46	21	2,772
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre	36	$5\frac{1}{10}$	2,411	37	2	2,250	36	$4\frac{9}{11}$	2,376
12	Unmanured	21	14	1,550	20	..	930	21	$9\frac{7}{11}$	1,493
13	Bone, finely ground, 500 lbs. per acre	33	1	1,969	41	1	1,875	33	$25\frac{8}{11}$	1,960
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	37	$6\frac{5}{10}$	2,186	42	27	2,085	37	$27\frac{10}{11}$	2,176
15	Nitrate of soda, 200 lbs. per acre	45	$24\frac{5}{10}$	2,669	49	29	2,835	46	$7\frac{4}{11}$	2,684
16	Muriate of potash, 150 lbs. per acre	34	21	2,145	35	20	1,690	34	24	2,103
17	Sulphate of ammonia, 300 lbs. per acre	43	$23\frac{5}{10}$	3,027	43	3	2,275	43	$21\frac{7}{11}$	2,958
18	Sulphate of iron, 60 lbs. per acre	36	$1\frac{5}{10}$	2,120	28	28	1,660	35	$13\frac{3}{11}$	2,078
19	Common salt (Sodium chloride) 300 lbs. per acre	35	18	1,976	31	21	1,485	35	$5\frac{10}{11}$	1,931
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre	32	24	2,024	33	8	1,602	32	$24\frac{8}{11}$	1,995
21	Mineral superphosphate, No. 2, 500 lbs. per acre	33	$4\frac{5}{10}$	1,871	33	28	1,660	33	$6\frac{7}{11}$	1,851

*Finely ground mineral phosphate was used on this plot from 1888 to 1897. Thomas' phosphate in 1898 only.

INDIAN CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be as far as is practicable in the late milk, or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the Dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888, 1889 and 1890. In 1891 the Red Cob Ensilage was used, and in 1892, 1893, 1894, 1895, 1896, 1897, 1898 and 1899 a free growing Flint variety, the Rural Thoroughbred White Flint, was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888, 1889 and 1890, the Thoroughbred White Flint in 1891 Pearce's Prolific in 1892, 1893 and 1894, and the Mammoth Eight Rowed Flint in 1895, 1896, 1897, 1898 and 1899. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way and 4 or 5 kernels in a hill. During the past seven years both sorts have been grown in hills. The corn in both series of plots was planted in 1899 on May 25, and cut September 15. In every instance the yield of fodder on these plots during the past season has been below the average of previous years.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, $\frac{1}{10}$TH ACRE EACH, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eleven Years.				12th Season, 1899.				Average Yield for Twelve Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder		½ Plot No. 2—Mam. 8 rowed, weight of green fodder		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure, well rotted, 12 tons per acre each year until 1899, no manure was used that season	16	240	12	696	10	160	8	1,920	15	1,233	12	131
2	Barn-yard manure, fresh, 12 tons per acre each year until 1899, no manure was used that season	17	724	11	785	8	1,940	5	1,080	16	1,325	10	1,809
3	Unmanured	7	1,278	5	1,004	1	1,820	1	1,880	7	323	5	410
4	Thomas' phosphate, 800 lbs. per acre	7	204	5	285	4	1,840	3	540	6	1,840	4	305
5	Thomas' phosphate, 800 lbs.; nitrate of soda, 200 lbs. per acre	10	1,708	8	1,662	6	400	7	620	10	932	8	1,408
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; Thomas' phosphate, 500 lbs. per acre; composted together, intimately mixed and allowed to heat for several days before using, applied each year until 1899, no manure or phosphate was used that season*	16	729	11	899	9	400	6	1,560	15	1,534	11	120
7	Thomas' phosphate, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre	15	305	10	1,782	9	820	8	960	14	1,347	10	1,380
8	Thomas' phosphate, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre	11	1,156	8	1,020	6	640	5	260	11	279	8	456
9	Mineral superphosphate, No. 1, 500, lbs. per acre	10	1,129	7	1,997	5	760	3	1,740	10	264	7	1,309

*Finely ground mineral phosphate was used on this plot from 1888 to 1897. Thomas' phosphate in 1898 only.

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Eleven Years.				12th Season, 1899.				Average Yield for Twelve Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thoroughb'd White Flint, weight of green fodder		1 Plot No. 2—Mam. 8 rowed, weight of green fodder		½ Plot No. 1—weight of green fodder		1 Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
10	Mineral superphosphate, No. 1, 350 lbs. nitrate of soda, 200 lbs. per acre.........	13	1,014	10	718	6	1,100	6	580	12	1,854	10	39
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre.............	16	139	11	1,769	8	1,800	8	300	15	944	11	1,146
12	Unmanured.....	10	1,103	8	1,350	5	300	3	1,160	10	202	8	500
13	Bone, finely ground, 500 lbs. per acre......	11	1,105	8	1,740	6	1,780	5	600	11	327	8	1,145
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre...........	12	345	8	1,990	6	1,780	6	80	11	1,464	8	1,497
15	Nitrate of soda, 200 lbs. per acre......	12	1,181	9	1,073	7	1,620	6	1,480	12	384	9	607
16	Sulphate of ammonia, 300 lbs. per acre....	12	1,696	9	1,516	8	1,460	8	200	12	1,009	9	1,239
17	Mineral superphosphate, No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre.............	13	554	9	760	4	1,480	3	920	12	1,297	8	1,773
18	Muriate of potash, 300 lbs. per acre.......	9	15	5	1,987	3	1,500	3	560	8	1,138	5	1,534
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash, 200 lbs., substituted each year since); dried blood, 300 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre..	11	1,415	7	1,873	5	1,940	4	100	11	458	7	1,225
20	Wood ashes, unleached, 1,900 lbs. per acre.	9	1,913	7	254	4	1,160	4	1,300	9	1,016	6	1,841
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre........................	12	1,418	8	1,558	5	1,070	3	1,170	12	222	6	692

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under, so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The preparation of the land has been the same for both these roots. It was ploughed in the autumn after the crop was gathered, gang-ploughed deeply in the spring after the barn-yarn manure had been spread on plots 1, 2 and 6, and after gang-ploughing the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown : 15 rows of Mammoth Long Red, 6 of Mammoth Long Yellow, and 6 of Golden Intermediate on each plot. In 1891, each plot again had three varieties : 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard, and 6 of Golden Tankard. In 1892, 1893, 1894, 1895, 1896, 1897, 1898 and 1899, one variety only was used, namely, the Mammoth Long Red. About 4 pounds of seed were sown per acre, each year. In 1899 the mangels were sown May 8, came up May 17, and were pulled October 16.

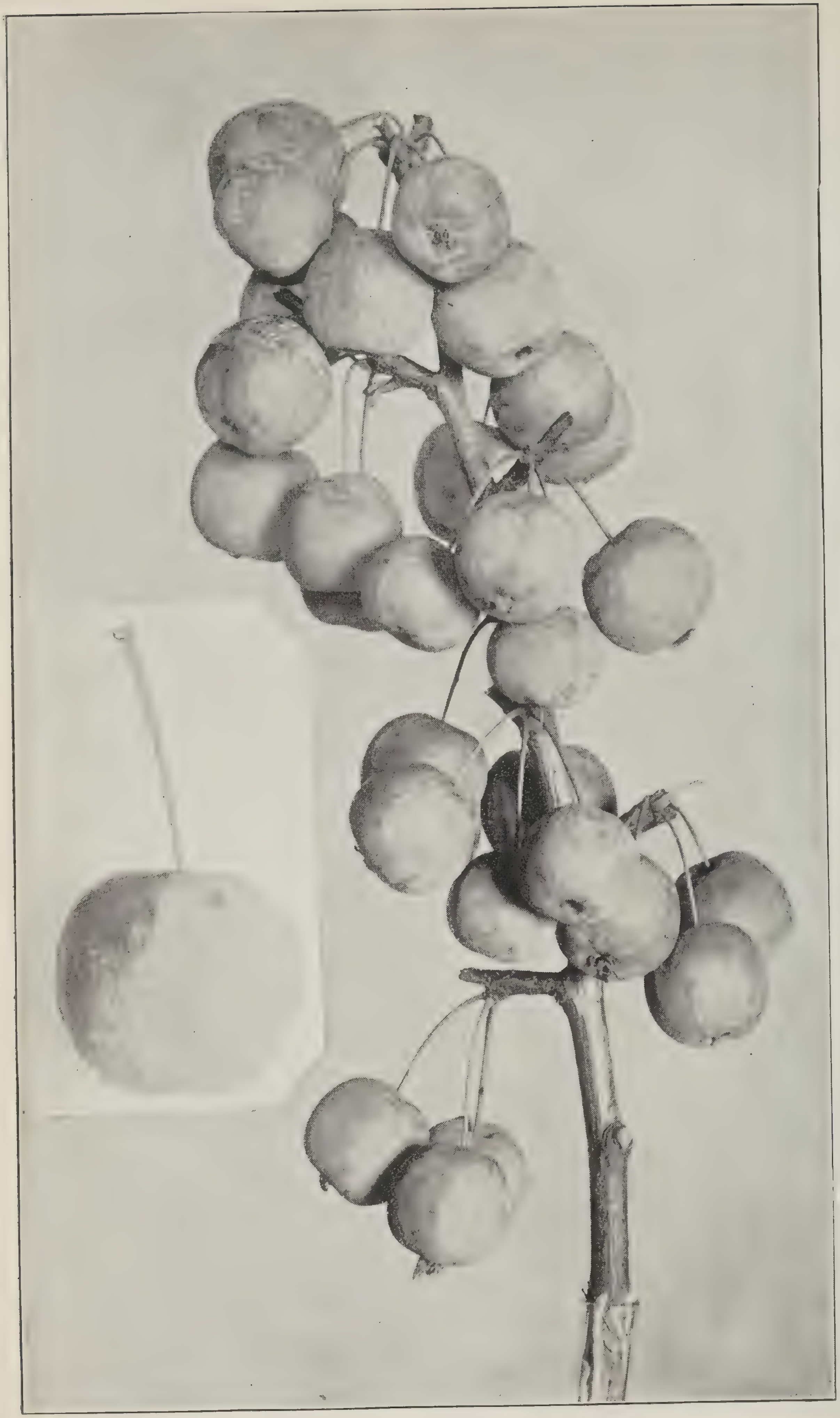
Two varieties of turnips were sown on the half plots devoted to these roots in 1889; 25 rows of Carter's Prize Winner, and 2 rows of Carter's Queen of Swedes, and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown; 6 rows of Lord Derby Swede, 4 of New Giant King, 3 of Imperial Swede, 6 of Champion Swede, 4 of Purple Top Swede, and 4 of East Lothian Swede. In 1892 the Improved Purple Top Swede only was sown, in 1893 and 1894 the Prize Purple Top Swede, in 1895 the Imperial Swede, and in 1896, 1897, 1898 and 1899 the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, was prepared in the same manner and the fertilizers spread on it at the same time as for the mangels. It was then allowed to stand until the day before sowing, when it was gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. In 1899 the turnips were sown June 7, came up June 12, and were pulled October 20. In most instances the yield of both turnips and mangels in 1899 was below the average of past seasons.

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS, $\frac{1}{20}$TH ACRE EACH.

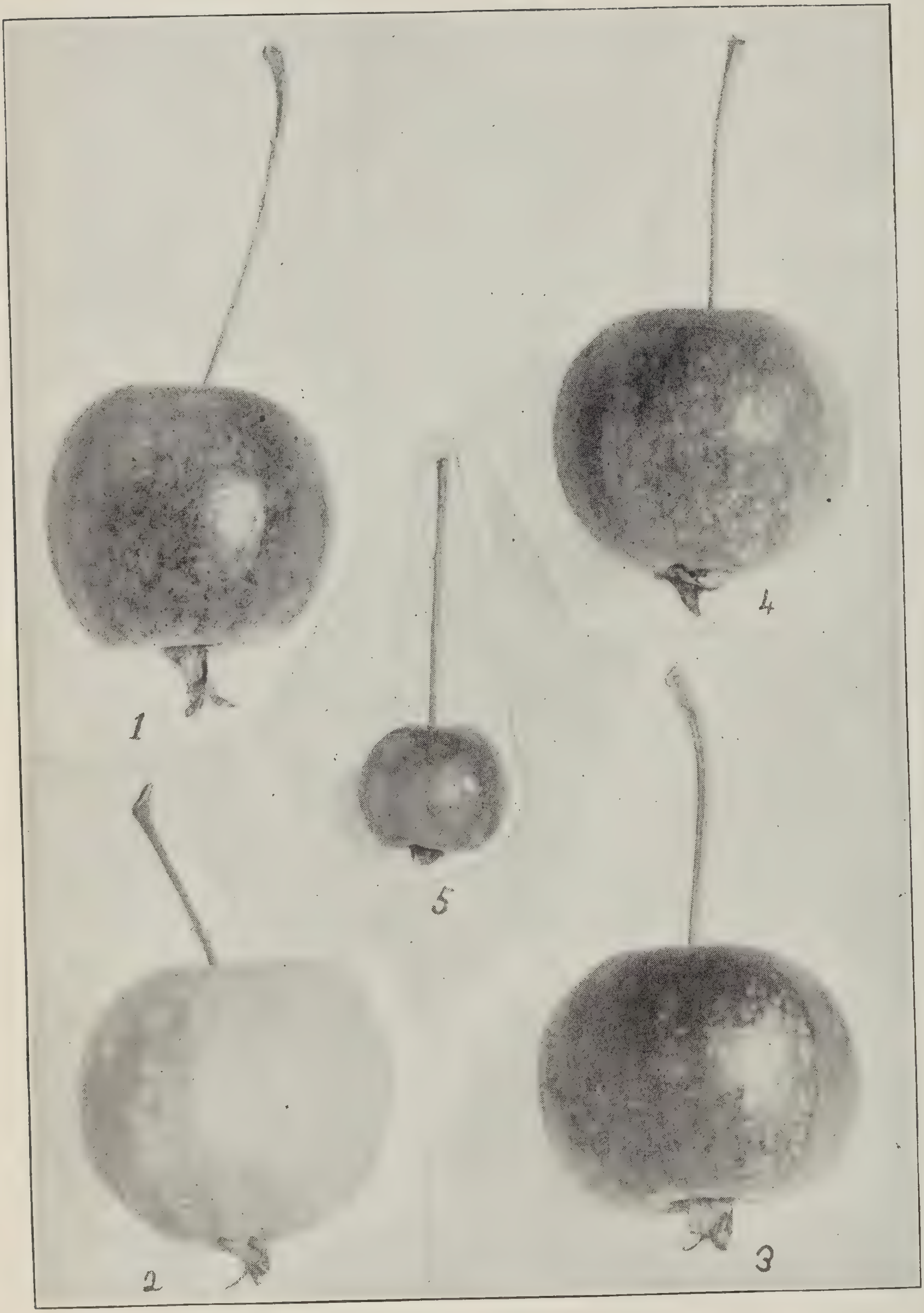
No. of Plot.	Fertilizers applied each Year.	Average Yield for Ten Years. Mangels, Weight of Roots. Per Acre.		Average Yield for Ten Years. Turnips, Weight of Roots. Per Acre.		11th Season, 1899. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre.		11th Season, 1899. Varieties. East Half Plot. Turnips, Purple Top Swede: Weight of Roots. Per Acre.		Average Yield for Eleven Years. Mangels, Weight of Roots. Per Acre.		Average Yield for Eleven Years. Turnips, Weight of Roots. Per Acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure, well rotted, 20 tons per acre each year until 1899; no manure was used that season..	23	212	15	196	17	800	15	60	22	1,174	15	183
2	Barn-yard manure, fresh, 20 tons per acre each year until 1899; no manure was used that season..........	22	269	15	854	15	1,300	14	140	21	1,090	15	607
3	Unmanured.........	9	214	7	124	5	1,320	5	1,260	8	1,587	6	1,863
4	Thomas' phosphate, 1,000 lbs. per ac.	8	1,101	7	599	6	80	7	540	8	644	7	593
5	Thomas' phosphate, 1,000 lbs.; nitrate of soda, 250 lbs.; wood ashes, unleached, 1,000 lbs. per acre.....	13	1,986	9	1,036	12	1,200	11	1,440	13	1,732	9	1,436
6	Barn-yard manure, partly rotted and actively fermenting, 12 tons per acre; Thomas' phosphate, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year until 1899; no manure or phosphate was used that season*....................	18	859	13	514	11	1,460	13	760	17	1,799	13	536
7	Thomas' phosphate, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre....................	10	1,012	9	486	13	800	12	280	10	1,472	9	1,012
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs., in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre	14	820	12	455	8	780	8	480	13	1,725	11	1,730
9	Mineral superphosphate, No. 1, 500 lbs. per acre....................	9	827	8	1,780	5	1,060	6	800	9	120	8	1,327

*Finely ground mineral phosphate was used on this plot from 1888 to 1897. Thomas' phosphate in 1898 only.

Cross-bred Pyrus Tree 'Charles,' Central Experimental Farm, Ottawa.



Cross-bred Pyrus 'Prairie Gem,' showing free fruiting habit and single specimen of natural size.



Specimens of Cross-bred Pyrus, natural size.
1.—Progress. 2.—Charles. 3.—Novelty. 4.—Aurora. 5.—Pyrus Baccata, natural size.

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of Plot.	Fertilizers applied each Year.	Average Yield for Ten Years.		11th Season, 1899, Varieties.		Average Yield for Eleven Years.	
				West Half Plot.	East Half Plot.		
		Mangels, Weight of Roots.	Turnips, Weight of Roots.	Mangels, Mammoth Long Red: Weight of Roots.	Turnips, PurpleTop Swede: Weight of Roots.	Mangels, Weight of Roots.	Turnips, Weight of Roots.
		Per Acre.	Per Acre.	Per Acre.	Per Acre.	Per Acre.	Per Acre.
		Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.	Tons. lbs.
10	Nitrate of soda, 300 lbs. per acre....	14 1,775	9 586	7 1,980	6 1,620	14 520	9 134
11	Sulphate of ammonia, 300 lbs. per ac..	11 1,600	10 1,684	6 1,540	5 500	10 145	10 667
12	Unmanured..........	7 1,008	7 233	3 1,820	4 120	7 354	6 1,677
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre	10 1,004	8 870	6 120	7 80	10 196	8 616
14	Wood ashes, unleached, 2,000 lbs. p. ac.	11 223	7 1,710	7 360	4 1,080	10 1,508	7 1,107
15	Common salt (Sodium chloride), 400. lbs. per acre	9 1,476	7 862	5 1,820	2 1,620	9 961	7 21
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per ac.	13 1,530	10 1,106	8 1,180	8 760	13 589	10 711
17	Mineral superphosphate, No. 1, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre.................. ...	12 1,816	9 659	8 680	5 1,760	12 985	9 31
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. p. ac.	12 1,163	10 444	8 940	7 460	12 415	9 1,900
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre.....	13 1,714	11 1,059	10 1,520	9 1,520	13 1,150	11 737
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre.........	14 1,073	10 582	9 1,500	8 100	14 202	10 183
21	Mineral superphosphate, No. 2, 500 lbs. per acre...	15 127	10 1,544	9 1,820	7 500	14 1,190	10 903

Since the grain grown on the fertilized plots during the past year has occupied in each case the full one-tenth acre, there has been no opportunity of continuing the experiments with carrots and potatoes.

NEW HARDY HYBRID FRUITS FOR THE CANADIAN NORTH-WEST.

During the spring of 1897, shortly after the work of the Experimental Farms was begun, a number of varieties of seeds were kindly forwarded to the Director by the late Dr. Regel, who at that time had charge of the Royal Botanic Gardens at St. Petersburgh, Russia. Among these was a package of the seed of *Pyrus baccata* a wild form of crab-apple known as the berried crab, a native of the northern parts of Siberia. Young trees were grown from this seed, and in 1890 and 1891 specimens were sent to the Experimental Farms at Brandon, Manitoba, and at Indian Head in the North-west Territories, to test their hardiness in those localities. These trees have been found quite hardy at both of these western experimental farms, and have started from the terminal buds on the branches every year since they were planted.

As this was the only form of the apple which had proven hardy in the Canadian North-west, after several years experience had established its hardiness, a series of experiments were instituted to improve the size and quality of the fruit, which in its native form is not much larger than a cherry, and is often quite astringent. The trees, however, bear fruit abundantly.

In the spring of 1894 this small wild crab was crossed with several varieties of hardy apples such as Tetofsky and Wealthy, also with some of the larger crabs, including Transcendent, Orange and Hyslop. The seeds obtained from these crosses were sown in the autumn of that year and germinated the following spring, producing in all about 160 thrifty young trees. These were planted the next year in a small orchard, in rows 5 feet apart each way. Some of them have grown very rapidly and have made shapely young trees. During the past season (1899) 36 of these trees have fruited and some of them have borne heavy crops. The fact that so many of these cross-bred trees have fruited on the fourth year from the sowing of the seed is very encouraging and indicates a very early bearing habit. Of the 36 trees which have fruited this year, five have borne fruit of such size and quality as to justify their being named and propagated. Several others among those which have fruited are promising and will be further tested. Most of those of less promise have been dug up and destroyed, so as to give the remaining specimens more room. Following are the names and descriptions of the five varieties referred to, given in what is believed to be the order of their merit.

CHARLES—(Fig. 2, Plate 1.) A cross of Tetofsky male on *Pyrus baccata* female. Tree a very upright and vigorous grower with large leathery leaves. See Fig. 2, Plate 1. The blossoms are deep pink in bud, pinkish white when open, large with wide petals. The fruit set well and the tree was fairly well laden, the fruit being distributed very evenly over the tree. It was ripe September 3, size $1\frac{9}{16}$th inches across, $1\frac{6}{16}$th inches deep, very distinctly ribbed. Colour a uniform yellow, very attractive. Flesh yellow, solid, crisp, juicy, mildly acid with a pleasant flavour, and slightly astringent. The skin is thin and the fruit bakes well. When compared with the Transcendent crab, the size was practically the same, and the acidity and astringency a little less; stem long, calyx persistent.

NOVELTY.—(Fig. 3, Plate 1.) A cross of Wealthy male on *Pyrus baccata* female. Tree fairly upright and a vigorous grower with good foliage On this tree there were only a few bunches of blossoms, which were deep pink in bud, white when open, flowers large, petals broad. Fruit ripe September 19. Size, $1\frac{1}{2}$ inches across and $1\frac{1}{4}$ inches deep, smooth, colour deep red. Flesh a pale yellowish pink, firm, crisp and juicy, sub-acid and of fair quality. Stem long, calyx usually persistent; bakes well. The largest and best of the Wealthy crosses which have yet fruited.

AURORA.—(Fig. 4, Plate 1.) A cross of Tetofsky male on *Pyrus baccata* female. Tree a vigorous grower, upright in habit, leaves large, thick and leathery, blossomed freely. Flowers deep pink in bud, large when open and pure white, petals broad. The fruit set freely and was ripe September 11. Size $1\frac{7}{16}$ inches across, $1\frac{3}{16}$ inches deep. Colour bright red almost all over; very pretty; flesh crisp, juicy, acid and of fair flavour; astringency very slight. When baked this fruit is acid, but of good flavour. Stems long, calyx persistent.

PROGRESS.—(Fig. 1, Plate 1.) A cross of Wealthy male on *Pyrus baccata* female. The tree is a vigorous grower and fairly upright in habit. It blossomed freely; the blossoms were deep pink in bud, pinkish white when open, flowers large, petals wide. Fruit ripe September 14. Size $1\frac{5}{16}$ inches across and $1\frac{3}{16}$ inches deep. Colour red, with some yellow and with a dark red cheek. Flesh very firm, crisp, sub-acid, juicy, astringency scarcely preceptible; of fair flavour. Stem long, calyx persistent. On plate 1, fig. 5, the fruit of *Pyrus baccata* is represented of natural size.

Prairie Gem.—A cross of Tetofsky male on *Pyrus baccata* female. This tree is a moderately vigorous grower, and rather spreading in habit. It was covered with blossoms, which were pink in bud, white when open, of medium size, with petals of medium width, and was covered with fruit from top to bottom. The fruit was ripe August 30. Size 1 inch across and 1 inch deep. Colour brilliant yellow and crimson. Flesh crisp, juicy, acid; flavour good, almost free from astringency; excellent for jelly. Deficient in size but promising for its earliness, quality and profuse bearing habit. On plate 3 a specimen of this fruit is shown of the natural size, also a branch of the same laden with fruit.

All these varieties are remarkable for the persistent manner in which the fruit is attached to the tree. The stems are so firmly fastened that they require a considerable effort to detach them. The trees are all very strongly built with the branches bound to the trees with bands of woody fibre which are difficult to break. Root grafts were made of some of these varieties in the spring of 1898, chosen on account of their promising growth. A number of these were sent at that time to Brandon and Indian Head, and thirty-one specimens of twenty-two varieties survived the winter at Indian Head and had made fair growth by the close of the season in 1899. At Brandon seventy-four specimens of twenty-five varieties passed safely through the winter of 1898 and made fair growth in 1899. In both these collections the variety named Charles is represented, three trees of this apple survived at Brandon and two at Indian Head. A further supply of root grafts of promising sorts was sent last spring, and now that the fruit of the five varieties referred to has proven of value these will be propagated more freely and arrangements are in progress for testing them in many different parts of the North-west country. There is every reason to expect that they will prove generally hardy and that they will be highly appreciated. It is not expected that these new fruits will be much esteemed where larger fruits can be grown, but if they can be grown without special care or protection by farmers generally throughout the North-west country and the colder sections of Ontario and Quebec where the larger sized apples do not succeed, they will prove a great boon to the settlers in those districts, and furnish a wholesome and healthful addition to the food of the people.

Since five good sorts have been found among the first thirty-six of these crosses which have fruited, it is probable that many other equally good or possibly superior sorts will occur among the many cross-bred trees,—about 270 now growing at Ottawa—which have not yet fruited.

Another series of crosses have been made on a species of *Pyrus* known as *Pyrus prunifolia* and its hardiness has been established by a test of several years on both of the North-west experimental farms. The natural fruit of this species is nearly double the size of *P. baccata*. The first crosses in this line were made in 1896, and some of the trees from this source are now two years old and are strong and vigorous in growth. The varieties of the different crosses with *Pyrus prunifolia* number about 200 in all, among which there will no doubt be many interesting sorts.

The results reported are but the first steps in a series of experiments which are full of promise. As the more useful of these hybrids bear fruit the seeds of the finest specimens are being sown from which we may expect many interesting sports. Now that the continuity of nature has been broken by the work of cross-fertilizing, the method of selection will be brought to bear on the best of the seedlings, from some of which increase in size and improvement in quality of fruit may be looked for, and within a few years we shall doubtless have from these sources a considerable number of useful sorts of apples ripening at different periods in the season which will endure the climate of all the settled parts of the North-west country.

DISTRIBUTION OF SEED GRAIN.

In 1899 a further distribution of seed grain was made consisting mainly of sample of the most promising sorts which have been tested at the several experimental farms. These distributions are designed to place within reach of farmers for the improvement

of seed, pure samples and true to name of the best and most productive varieties in cultivation. By the careful handling of one of these samples of 3 pounds of grain, any farmer can soon obtain sufficient seed to sow a large area and may thus in a short time be provided with some of the best sorts, without cost beyond that of his own labour. This part of the farm work is much commended and highly appreciated by a very large number of practical farmers and the need of the work is shown by the large demand each year for samples.

Preparations have been made for another distribution in 1900, which will consist as heretofore of the most promising sorts of oats, barley, spring wheat, pease, Indian corn and potatoes. The several branch farms will also again distribute samples to farmers residing in the provinces and territories where these farms have been established.

The samples sent out from the Central Experimental Farm during the early months of 1899, were distributed as follows.

Kind of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	793	1,335	1,454	2,017	2,081	753	432	70
Barley	169	466	204	904	780	143	87	23
Wheat	594	894	1,347	2,304	1,167	421	224	37
Pease	74	426	396	925	653	255	151	46
Indian Corn	42	208	199	360	587	53	15	19
Potatoes	438	731	1,084	1,262	1,914	461	278	106
Total	2,110	4,060	4,684	7,772	7,182	2,086	1,187	301

Total number of samples distributed 29,405
Number of applicants supplied 29,382

The following list shows the number of 3-pound packages of the different varieties which have been sent out:—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
		BARLEY.	
OATS.		*Six-rowed.*	
Improved Ligowo	1,799	Mensury	651
Banner	1,160	Odessa	385
Abundance	1,050	Royal	277
Siberian O.A.C	949	Trooper	264
Wallis	939	Oderbruch	163
American Beauty	932	Champion	159
Bavarian	700	Success	118
Golden Giant	471		
Golden Beauty	393	*Two-rowed.*	
Joanette	340		
Early Gothland	128	Sidney	324
Mennonite	111	French Chevalier	143
White Schonen	8	Danish Chevalier	79
		Beaver	3
Total	8,980	Total	2,566

Number of 3-pound packages of the different varieties which have been sent out—*Con.*

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
SPRING WHEAT.		INDIAN CORN—*Concluded.*	
Preston	1,503	Mammoth Eight-rowed Flint	35
Red Fife	1,268	Compton's Early	22
White Connell	924	Champion White Pearl	21
Wellman's Fife	715	Pearce's Prolific	8
White Fife	715		
Percy	668	Total	1,499
Monarch	277		
Red Fern	257		
White Russian	257	POTATOES.	
Rio Grande	125		
Beauty	107	Northern Spy	673
Ladoga	15	Daisy	592
		Empire State	555
Total	6,831	Wonder of the World	520
		American Wonder	455
PEASE.		Burnaby Seedling	443
		Carman No. 1	343
Victoria	977	Vanier	342
Wisconsin Blue	564	Dakota Red	341
Canadian Beauty	337	Early Harvest	313
Prussian Blue	276	Late Puritan	288
French Canner	157	Lee's Favourite	284
Arthur	143	Rochester Rose	277
Improved Sugar Marrow	129	I. X. L	275
Pride	58	Clarke's No. 1	266
		May Queen Early	211
Total	2,641	Early Sunrise	196
		Early Rose	162
		Queen of the Valley	126
INDIAN CORN.		Burpee's Extra Early	109
		Everett	88
Selected Leaming	629	Irish Daisy	6
White Cap Yellow Dent	304	Holborn Abundance	6
Longfellow	275	Other varieties in all	17
Angel of Midnight	132		
Mitchell's Early	73	Total	6,888

A NEW FEATURE IN THE GRAIN DISTRIBUTION.

During the past year a new feature has been introduced in connection with the distribution of seed grain. In sending out the 3-pound samples in the past it has scarcely been practicable to prescribe any particular size of plot on which these samples should be sown, each applicant has used his own judgment in that respect and there has been much variation in this particular. On this account no information could be obtained as to the relative yield per acre of the different sorts under trial. Under the new arrangement sufficient seed has been sent to sow one-tenth of an acre for which 8 pounds of oats and 10 pounds of barley or spring wheat have been supplied.

Fourteen of the best varieties of grain were chosen for this special purpose, six of oats, four of spring wheat and four of barley. As it was not practicable to send this quantity of grain to all applicants a select list of farmers was made by choosing from each constituency a few of those who had shown by their reports on the 3-pound samples that they were much interested in this important work. A circular was sent to each one with the names of the different sorts of grain to be sent out, and an opportunity afforded for each farmer to make choice of the variety he preferred. An active interest was taken in this subject by farmers in all parts of the Dominion and the total number who have taken part in the test is 4,320.

These samples were distributed by provinces as follows :—

Name of Grain.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	N.W.T.	B.C.
Oats	64	209	240	587	744	130	113	50
Spring wheat	80	98	211	508	329	50	20	23
Barley	37	116	69	304	256	48	16	12
Total	181	423	520	1,399	1,329	228	149	85

The following list shows the number of 8-pound or 10-pound packages of the different varieties which have been sent out.

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		BARLEY.	
		Two-rowed.	
Abundance	630		
Improved Ligowo	343		
Banner	340	Beaver	161
American Beauty	334	Sidney	68
Golden Giant	295		
Bavarian	179		
		Six-rowed.	
Total	2,121		
		Royal	466
SPRING WHEAT.		Trooper	155
Preston	730		
Percy	342		
Stanley	205		
Advance	76		
Total	1,353	Total	860

Many samples have also been distributed from the branch experimental farms. Full particulars relating to these will be found in the reports of the Superintendents of the branch farms.

TESTS OF THE VITALITY OF GRAIN AND OTHER SEEDS FOR 1899.

During the season of 1899, 2,058 samples of seed grain and other seeds were tested chiefly for farmers, to ascertain the proportion which would germinate. Many of the samples received for test are much below the average and do not fairly represent the germinating power of the grain of average quality grown in different parts of the Dominion. The object in view in carrying on this work from year to year, is to give farmers the opportunity of having any samples which may be of doubtful vitality through injury during harvesting or storing, or from frost, thoroughly tested so that their value for seed purposes may be ascertained. Samples may be sent free through the mail and the quantity of grain sent should not be less than one ounce. The samples are tested and reported on free of charge and their proportion of vitality can usually be determined within a fortnight after they are received.

RESULTS of Tests of Seeds for Vitality, 1898–99.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	808	100·0	3·0	79·2	5·8	85·0
Barley	315	100·0	19·0	80·3	8·8	89·1
Oats	449	100·0	8·0	81·7	6·0	87·7
Rye	3	92·0	84·0	84·6	4·0	88·6
Pease	155	100·0	28·0	......	......	85·2
Corn	5	100·0	10·0	......	......	56·0
Grass	20	95·0	6·0	......	......	62·2
Clover	7	89·0	19·0	......	......	73·0
Turnips	21	93·0	29·0	......	......	66·7
Mangels	3	74·0	50·0	......	......	61·3
Carrots	10	62·0	21·0	......	......	45·2
Cabbage	33	90·0	13·0	......	......	54·9
Tomatoes	18	82·0	4·0	......	......	35·5
Radish	10	74·0	27·0	......	......	51·4
Lettuce	24	90·0	1·0	......	......	42·3
Spinach	6	60·0	16·0	......	......	39·3
Onions	20	75·0	25·0	......	......	51·6
Celery	18	82·0	4·0	......	......	35·5
Squash	18	80·0	0·0	......	......	42·2
Cucumber	11	80·0	0·0	......	......	43·3
Musk Melon	16	80·0	8·0	......	......	39·0
Water Melon	14	72·0	0·0	......	......	31·0
Flax	6	94·0	17·0	......	......	65·5
Cauliflower	6	63·0	44·0	......	......	54·3
Borecole	3	78·0	38·0	......	......	64·0
Brussel Sprouts	2	85·0	84·0	......	......	84·5
Parsley	3	39·0	15·0	......	......	31·0
Pepper	4	41·0	4·0	......	......	17·5
Salsify	3	83·0	43·0	......	......	58·6
Chicory	2	77·0	68·0	......	......	72·5
Leeks	2	53·0	37·0	......	......	45·0
Cress	3	73·0	45·0	......	......	63·6
Asparagus	3	39·0	3·0	......	......	17·3
Tares	2	91·0	26·0	......	......	58·5
Nasturtium	2	92·0	64·0	......	......	78·0
Carraway Seed	2	6·0	2·0	......	......	4·0
Tobacco	2	59·0	43·0	......	......	51·0
Mignonette	4	39·0	18·0	......	......	29·5
Horehound	2	9·0	1·0	......	......	5·0
Sweet Basil	2	92·0	44·0	......	......	68·0
Sweet Marjoram	3	32·0	14·0	......	......	20·6
Summer Savory	2	22·0	15·0	......	......	18·5
Sage	1	71·0	71·0	......	......	71·0
Saffron	1	13·0	13·0	......	......	13·0
Fennel	1	21·0	21·0	......	......	21·0
Thyme	1	16·0	16·0	......	......	16·0
Balm	1	7·0	7·0	......	......	7·0
Lavender	1	23·0	23·0	......	......	23·0
Rue	1	32·0	32·0	......	......	32·0
Egg Plant	1	5·0	5·0	......	......	5·0
Beans	1	100·0	100·0	......	......	100·0
Canary Seed	1	73·0	73·0	......	......	73·0
Rape	1	97·0	97·0	......	......	97·0
Rhubarb	1	70·0	70·0	......	......	70·0
Parsnips	1	3·0	3·0	......	......	3·0
Mustard	1	74·0	74·0	......	......	74·0
Endive	1	74·0	74·0	......	......	74·0
Chervil	1	18·0	18·0	......	......	18·0
Total number of samples tested, highest and lowest percentage	2,058	100·0	0·0	......	......	......

TABLE showing Results of Grain Tests for each Province.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	217	100·0	3·0	78·4	4·7	83·1
Barley	114	100·0	27·0	74·3	12·3	86·6
Oats	147	100·0	38·0	92·0	4·2	96·2
QUEBEC.						
Wheat	52	100·0	74·0	89·6	4·3	93·9
Barley	45	100·0	85·0	88·2	6·2	94·4
Oats	23	100·0	85·0	91·3	3·2	94·5
MANITOBA.						
Wheat	327	100·0	14·0	74·9	6·9	81·8
Barley	62	100·0	19·0	83·2	6·9	90·1
Oats	104	100·0	8·0	83·6	6·3	89·9
NORTH-WEST TERRITORIES.						
Wheat	134	99·0	64·0	82·7	6·3	89·0
Barley	57	100·0	64·0	82·4	6·8	89·2
Oats	118	100·0	15·0	60·3	9·9	70·2
NOVA SCOTIA.						
Wheat	30	99·0	64·0	85·3	4·9	90·2
Barley	18	97·0	67·0	76·2	9·2	85·4
Oats	16	100·0	77·0	87·8	4·7	92·5
NEW BRUNSWICK.						
Wheat	25	100·0	62·0	86·7	4·5	91·2
Barley	10	100·0	80·0	86·8	6·5	93·3
Oats	16	100·0	85·0	92·3	3·2	95·5
PRINCE EDWARD ISLAND.						
Wheat	16	99·0	55·0	83·0	6·1	89·1
Barley	6	99·0	68·0	76·8	7·2	84·0
Oats	15	100·0	91·0	93·3	3·3	96·6
BRITISH COLUMBIA.						
Wheat	7	100·0	88·0	92·6	2·1	94·7
Barley	3	100·0	88·0	92·6	3·0	95·6
Oats	10	100·0	92·0	96·2	1·6	97·8

WILLIAM T. ELLIS,
In charge of Seed Tests.

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1899; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall and snowfall.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days' Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		in.	in.	in.		in.	
Jan.....	24·67	2·33	22·34	13·50	46·0	5th	—22·9	10th	1·13	10·50	2·18	20	0·42	15th
Feb.....	21·22	3·53	17·69	12·37	41·0	20th	—24·1	12th	0·29	5·75	0·86	14	0·35	22nd
March ..	30·14	13·55	16·59	21·84	41·0	3rd	—8·6	17th	1·13	44·75	5·60	17	1·00	19th
April ...	52·24	32·20	20·04	42·22	84·0	30th	15·7	6th	1·03	......	1·03	10	0·53	8th
May	68·91	45·85	23·06	57·38	80·0	26th	37·2	10th	4·72	......	4·72	13	1·26	30th
June....	76·74	54·57	22·17	65·66	88·9	5th	46·2	11th	2·97	....	2·97	12	0·73	15th
July.....	78·31	57·25	21·05	67·77	86·8	2nd	43·8	20th	9·85	......	9·85	17	2·92	11th
August..	81·75	56·95	24·80	69·35	93·7	19th	45·9	14th	0·38	......	0·38	7	0·24	22nd
Sept	65·69	46·09	19·60	55·89	84·2	3rd	32·5	23rd	5·59	......	5·59	17	1·76	26th
Oct	56·29	39·46	16·83	47·87	72·1	25th	25·0	22nd	2·71	......	2·71	11	0·84	29th
Nov.....	39·68	28·48	11·19	34·07	51·5	7th	14·0	13th	1·90	0·50	1·95	10	0·56	1st
Dec	29·20	15·53	13 66	22·36	48·5	12th	—17·9	31st	2·16	15·75	3·79	18	0·91	24th
									33·86	77·25	41·63	166		

Rain or snow fell on 166 days during the 12 months.
Heaviest rainfall in 24 hours, 2·92 inches on July 11.
Heaviest snowfall in 24 hours, 10·00 inches on March 19.
It will be seen the highest temperature during the 12 months was 93·°7 on August 19.
The lowest temperature during the 12 months was −24·°1 on February 12.
During the growing season rain fell on 10 days in April, 13 days in May, 12 days in June, 17 days in July, 7 days in August and 17 days in September.
August shows the lowest number of days on which rain fell, viz., 7.
Rain or snow fell on 20 days in January.
Total precipitation during the 12 months, 41·63 inches, as compared with 37·17 inches during 1898.

WM. T. ELLIS, *Observer.*

RECORD OF SUNSHINE AT CENTRAL EXPERIMENTAL FARM, OTTAWA, 1899.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
January	18	13	91·2	2·94
February	19	9	102 1	3·64
March	17	14	124·1	4·00
April	26	4	228·8	7·62
May	27	4	225·4	7·27
June	29	1	257·1	8·57
July	29	2	271·3	8·75
August	31	0	271·2	8·74
September	22	8	128·9	4·29
October	23	8	120·4	3·88
November	17	13	77·0	2·56
December	17	14	50·1	1·61

RAINFALL, Snowfall and total Precipitation for 10 years, 1890 to 1899, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
	Inches.	Inches	Inches.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	36·02
1899	33·86	77·25	41·63
Total	264·87	853·10	350·27
Yearly average	26·48	85·31	35·02

WM. T. ELLIS, *Observer.*

WHAT THE EXPERIMENTAL FARMS HAVE DONE TO STIMULATE TREE PLANTING.

Experiments in tree planting were begun at all the Experimental Farms as soon as practicable after the sites selected were secured, but as the need for forest shelter is greater on the open plains in the North-west country, special attention has been given to this subject on the branch experimental farms at Brandon, Manitoba; and at Indian Head, in the North-west Territories.

CENTRAL EXPERIMENTAL FARM.

In 1888 forest tree planting was begun on this farm and two blocks of land devoted to this purpose. One of these 165 feet in width extends entirely across the west end of the farm, the other a narrower piece 65 feet in width, extends the full length of the north boundary. It was not practicable to complete this planting quickly, about 3,000 trees were planted in 1888, 7,700 in 1889 and the area of planting was added to from year to year until 1894 when the work was completed. These forest plantations contain about 20,800 trees including most of the more important timber trees which are hardy in this climate.

The objects in view in planting these forest belts at Ottawa were :—

1st. To ascertain the relative growth, in height and circumference of trunk of a number of different trees when planted at different distances apart. The distances chosen in this instance for trial were 5 feet by 5, 5 feet by 10 and 10 feet by 10.

2nd. To gain information as to the relative growth of these trees when planted in blocks of one sort, as compared with mixed clumps.

3rd. To find out how far farm crops located near tree belts will be influenced by the shelter they afford.

The pleasing effects produced on the landscape by blocks of trees when suitably grouped were not overlooked, but the main purpose has been to gain such practical information relating to the growth of the more important timber trees in this climate, as would be useful to those who may in future engage in timber growing in this country. Measurements of the annual growth of representative examples of the different sorts of

trees have been taken from time to time and the particulars published in the Reports of the Experimental Farms.

Forest trees sent to the branch experimental farms and to settlers for test.

In 1888, 2,800 young forest trees of twenty-eight sorts were sent from the Central Farm to the branch experimental farm at Nappan, Nova Scotia, to be tested in that climate, 20,000 were also sent to the branch farm at Indian Head, in the North-west Territories.

In 1889 some additional smaller supplies of trees were sent to Nappan, 12,000 trees and shrubs of 118 varieties were sent to the branch experimental farm at Brandon, Man., 15,000 to Indian Head, N.W.T., and 7,000, chiefly of the most valuable hard woods of the East, were sent to the branch experimental farm at Agassiz, in British Columbia.

Experimental gardens in which forest trees were to be tested, were laid out that year by the Canadian Pacific Railway at twenty-five different points on the main line between Moosejaw and Calgary. To each of these stations a bundle of well-rooted young forest trees was sent from the Central Experimental Farm, each package containing 175 trees of thirty-seven different species.

During this season 700 1-pound bags of tree seed were also distributed for test, consisting chiefly of box elder, green ash, butternut and black walnut. These were sent to farmers for planting, in different parts of the Dominion.

In 1890, 21,700 trees and shrubs were sent to the branch farm at Brandon, Man., 15,000 to Indian Head, N.W.T., and 8,000 to Agassiz, B.C.

To farmers—mainly to those residing in the Canadian North-west, there were sent that season 131,600 young forest trees and shrubs in 1,316 packages of 100 each, with instructions for planting and care. About 3,500 trees, in packages of about 150 each were also sent to the chief stations of the Mounted Police and to the Indian agencies in different parts of the North-west country.

In 1891 smaller supplies of trees and shrubs, including sorts not hitherto tested, were sent to the branch farms at Nappan, N.S., Brandon, Man., and Indian Head, N.W.T., and an additional supply of 7,284 to Agassiz, B.C.

The young forest trees sent by mail that year to settlers in Manitoba and the North-west Territories numbered 200,000. These were sent in 2,000 packages, each containing 100 trees.

During 1890 the native trees growing in the coulées and bluffs in the North-west bore an abundant crop of seeds, and with the aid of Indians and Half-breeds, nearly three tons of these were collected. These seeds were chiefly box elder and green ash, of which 4,053 1-pound bags were sent to applicants in Manitoba and the Territories. Limited distributions were also made at Brandon and Indian Head, and the remainder planted at these two farms in large seed beds.

In 1891 frosts destroyed most of the tree seeds, and very few could be obtained.

1892. In this and every subsequent season to the present, many additional species and varieties of trees and shrubs have been sent to each of the branch farms, new sorts which could not be procured earlier, including all those obtainable which were likely to prove hardy and useful in the different climates in which these farms are located.

This year 45,218 trees, a large proportion of which were evergreens, were sent in 983 packages by mail to North-west settlers for trial, and 91,800 cuttings of hardy poplars and willows were similarly distributed.

As no tree-seeds could be had in 1891, and the trees in 1892 were again well laden, nearly 3 tons more were collected in the autumn of that year.

In 1893, 83,000 young trees and cuttings were sent out to settlers, also 1,523 1-pound bags of tree seeds.

Since 1893, arrangements have been made to supply settlers in Manitoba as far as is practicable with young forest trees and tree seeds from the experimental farm at Brandon, and those residing in the Territories from the farm at Indian Head. Many applications, however, continue to be made to the Central Farm for tree seeds, and to meet this demand about 300 pounds have been obtained each year from the supplies collected at Brandon and Indian Head, and sent out from Ottawa.

The tree planting and tree distribution during the past twelve years at the Central Experimental Farm has aggregated as follows :--Planted at Ottawa, including forest belts, ornamental grounds, avenues, hedges and Arboretum, over 40,000 specimens. Total number of trees sent to the branch farms at Nappan, about 4,000 ; Brandon, 65,000 ; Indian Head, 70,000 ; Agassiz, 35,000.

The distribution from the Central Farm throughout the Dominion has been chiefly to settlers in the North-west. To these there have been sent during the same period about 560,000 young forest trees and cuttings, mostly in bundles of 100 each, and about 9,000 pounds (4½ tons) of tree seeds.

EXPERIMENTAL FARM, NAPPAN, N.S.

From the supplies of forest trees and shrubs sent to Nappan, much useful information has been gathered in reference to the hardiness and suitability of the different species to that climate. Permanent plantations have been made and a limited number of trees and shrubs have been sent for trial to farmers in different parts of the Maritime Provinces.

EXPERIMENTAL FARM, BRANDON, MAN.

A large proportion of the 65,000 trees and shrubs sent from the Central farm to Brandon, have been used for trial planting on that farm ; while many of the varieties have proved tender in that climate and a large number of trees have died, many others have been successfully grown. At the same time many thousand young trees have been raised from seed of native species and these have been set out in the plantations. The number of trees now growing on this branch farm in wind-breaks, avenues, hedges, Arboretum and nurseries is estimated at from 70,000 to 80,000. The Brandon farm has greatly aided tree growing in Manitoba by the practical object lessons it has given to the public in the various methods of tree planting adopted there. It has also distributed among the farmers of Manitoba young trees for test usually in bundles of 100 to each farmer and tree seeds in 1-pound bags as follows :—

In 1891	Trees and cuttings	20,500		
1892	" "	40,000		
1893	" "	60,000	Tree seeds 1-lb. bags....	400
1894	" "	46,800	" "	350
1895	" "	29,550	" "	226
1896	" "	77,700	" "	—-
1897	" "	90,600	" "	385
1898	" "	148,700	" "	165

Making in all 513,850 young forest trees and cuttings and 1,526 one pound bags of tree seeds sent out from this farm to the end of 1898.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

The branch farm at Indian Head has also done much to promote tree growing on the plains. To the 70,000 trees sent there from the Central Farm, there have been added a very large number of native trees grown from seed collected in the Territories, and it is estimated that there are now growing on that farm about 125,000 trees.

There has also been sent from the Indian Head farm to settlers in the Territories, young forest trees and cuttings in mail packages of about 100 each, and of tree seeds in 1-pound bags as follows :—

In 1890	trees and	cuttings	12,000				
1892	"	"	17,700				
1893	"	"	5,000	Tree seeds	1-lb. bags	....	200
1894	"	"	14,576	"	"	....	532
1895	"	"	19,350	"	"	....	360
1896	"	"	18,055	"	"	....	...
1897	"	"	16,796	"	"	....	1,460
1898	"	"	23,920	"	"	....	424
1899	"	"	59,700	"	"	....	381
			187,097				3,357

Making a total of 187,097 young forest trees and cuttings, and 3,357 one pound bags of tree seeds sent out during the period named.

EXPERIMENTAL FARM, AGASSIZ, B.C.

The 35,000 young trees sent to this farm—about two-thirds of which were of hard woods from the East—have been mostly used for planting on the Experimental Farm, chiefly on the sides of the low mountains forming part of the farm property. This has been done with the object of finding out whether these useful trees so valuable for their timber can be successfully grown in this climate. A limited distribution from among these has, however, been made to parties specially interested in tree growing in British Columbia. A few varieties including some of the more ornamental sorts have also been sent for planting on the grounds about the more important stations on the line of the Canadian Pacific Railway.

SUMMARY.

From the figures presented it will be seen that during the comparatively brief period of twelve years, since the experimental farms were founded, these useful institutions have laid the foundation for a great advancement in tree growing in Canada in the near future. There are now growing on the five Experimental Farms a grand total of about 245,000 trees. There has also been sent out from these farms during the period mentioned to individual lovers of trees in small lots of about 100 each 1,261,000 (more than $1\frac{1}{4}$ millions) young forest trees and cuttings and 14,000 pounds (7 tons) of tree seeds, every pound of which with reasonable care may be expected to produce from 500 to 800 young seedlings. The results of this work are now everywhere apparent. On homesteads in almost every part of Manitoba and the Territories there are small plantations of forest trees which furnish more or less shelter for the growing of garden vegetables, small fruits and flowers, also for buildings and stock and at the same time make the dwellings of the settlers more attractive and home like.

Since experience has shown that the box elder or Manitoba maple, the tree which has been most largely used in this work, begins to produce seed when about six or seven years old a large number of the trees early distributed must now have reached a seed-bearing age. On the western experimental farms a very large quantity of tree seeds are now ripened every season, on young trees planted since the farms were established, and from this time forward all over the country year after year as the number of seed bearing trees increase, immense and constantly increasing quantities of seed will be available and convenient for use, and thus an enormous impetus will be given to tree-growing especially on the North-west plains.

CORRESPONDENCE.

The following is a summary of the letters received and sent out at the Central Experimental Farm from November 30, 1898, to November 30, 1899, also the number of reports, bulletins and circulars forwarded by mail during the same period:—

—	Letters Received.	Letters Sent.
Director	42,653	19,325
Agriculturist	1,361	2,512
Horticulturist	1,318	1,346
Chemist	1,257	1,595
Entomologist and Botanist	2,495	2,320
Poultry Manager	1,507	1,092
Accountant	1,086	1,343
Totals	51,677	29,533

Circular letters sent, including circulars sent with samples of seed grain.......... 43,132
Number of reports and bulletins mailed.......... 152,826

SOME JOURNEYS UNDERTAKEN DURING THE YEAR.

EXPERIMENTAL FARM, NAPPAN, N.S.

Two visits were made to the Experimental Farm at Nappan, Nova Scotia, during 1899, the first early in May and the second during the month of October. On both these occasions careful inquiry was made regarding the work in progress. At both times the dairy herd was found in good condition and the cows were giving a good flow of milk. The steers which had been fed during the winter of 1898-9 were disposed of before my early visit was made, at good prices. Their presence during the feeding period had materially increased the quantity of barn-yard manure available for the ensuing crops. An additional area of land was cleared during the winter of 1898–9, which has since been utilized as pasture for cattle. The water supply provided last year, drawn from springs on the rear end of the farm, has proved an abundant one, ample for the stock barns as well as for the dwellings on the farm. The quality of the water is excellent.

In October I found the crops all gathered with the exception of the turnips, which were then being brought in. Nothwithstanding the cold and backward spring which had delayed seeding, most of the grain crops had turned out remarkably well. The oats and wheat both gave yields considerably above the average. The straw was strong and bright and the grain well developed and plump. The root crop was also good.

The fruit trees in the orchards had made fair growth, and all sorts of small fruits had done well. The hedges, shelter belts and plantations of shrubs and trees were all in a thriving condition and had made satisfactory progress.

ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

About the middle of August I visited Columbus, Ohio, where I had the privilege of attending the meetings of the American Association for the Advancement of Science, also the meetings of the Society for the Promotion of Scientific Agriculture. The attendance was large, and distinguished men representing every branch of science were there, and many valuable contributions were made to our knowledge in the papers which

were presented. The facts submitted relating to the progress of agriculture were especially valuable to those interested in that subject and elicited much discussion and comment. The meetings were held in the large and commodious buildings of the University of Ohio, and opportunities were thus afforded of visiting the museums rich in botanical, entomological and other specimens and of examining the large collection of trees and shrubs on the University grounds. The week spent there was a profitable one.

MINNESOTA EXPERIMENT STATION.

Journeying westward, two days were given to an examination of the work in progress at the Minnesota Experiment Station at St. Anthony's Park near Minneapolis. Much advancement has been made since my visit there in 1894. Many new buildings have been erected and the grounds very much improved by the growth which has taken place in the trees and shrubs as well as by additional planting.

Although the grain crops had all been harvested, there was much to interest one in the plantations of small and large fruits as well as in ornamental trees and shrubs. A large collection of improved varieties of American plums has been brought together there and under the guidance of the Horticulturist, I had ample opportunities for testing the relative merits of a number of different sorts which were then in process of ripening. Many varieties of the hardier sorts of Russian apples were being tried with a considerable degree of success.

In company with the assistant agriculturist, I also had the privilege of visiting some of the large flour mills in Minneapolis, and of inquiring into the newer methods in use there of determining the relative value of the different sorts of wheat when converted into flour.

NORTH DAKOTA EXPERIMENT STATION.

The experiment station of North Dakota was next visited, which is located near Fargo. At the outset the conditions and surroundings of this institution were much like those of the experimental farm at Indian Head. Both originally were started on bare prairie lands and much attention has been given to tree planting for shelter and ornament. The progress made at Indian Head has been much more rapid and the field of work covered more extended than at Fargo. There were, however, many things of interest to be seen and inquired into, which made the day spent there under the kind guidance of the station officials both pleasant and profitable.

EXPERIMENTAL FARM, BRANDON, MAN.

Leaving Fargo, the journey was continued to the branch farm at Brandon. Although too late to see many of the standing crops most of the grain from the experimental plots was still in stook. Notwithstanding that the season had opened unfavourably and that wet weather had delayed seeding in the spring, the grain crops at this farm were excellent and the yield in some cases very large. This was notably the case with oats and wheat. Some of the most productive sorts of oats had given from 100 to 110 bushels per acre, and some of the best of the wheats from 30 to 45 bushels per acre. Pease had yielded good crops. Awnless Brome grass and some native grasses gave remarkably good returns, the yields of field roots and potatoes were about an average, while Indian corn and Millets gave lighter crops than usual.

The stock was in a healthy state, the implements well cared for and the progress of the farm work in a general way very satisfactory. The small fruit plantations had done well and the ornamental trees, shrubs and hedges had made excellent growth. The flower beds about the buildings were gay with bloom of varied hues, and were proving very attractive to a large and increasing circle of visitors.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

This farm was next visited, and the various branches of work conducted there inquired into. The horses, cattle, swine and poultry were all in good condition and gave evidence of careful handling. The barns were well stored with excellent hay, the product of the fields of Awnless Brome grass and native Western Rye grass on the farm. Owing to the unusually favourable conditions of moisture in 1899, the hay crop has been very good.

The spring was very wet which made seeding unusually late and after it was fairly begun its progress was several times interrupted by heavy storms. With abundance of moisture and a very rich soil the growth of straw was rank, and in some districts this delayed the ripening of the grain so that some of it was injured by frost before it was fully matured. At the Indian Head farm, however, all the cereal crops gave a bountiful return. Most of the best varieties of wheat gave from 30 to 38 bushels per acre, oats from 80 to 95 bushels, and barley from 55 to 65 bushels per acre.

Good crops of field roots have also been produced, but the crop of Indian corn has been light. The shelter belts and other tree plantations have made remarkable growth and the wood ripened fairly well before winter set in. Many of the early planted trees on this farm are now yielding an abundance of seed which is gathered each season and distributed among farmers who apply for it in different parts of the Territories.

WESTWARD THROUGH THE CROW'S NEST PASS.

Proceeding westward a trip was made through the Crow's Nest Pass where the scenery although not nearly so grand as on the main line of the Canadian Pacific Railway is very varied and interesting. Wonderful development is going on in that portion of the Dominion. The output of coal is enormous and the growth of some of the towns phenomenal. At Fernie, on the western slope of the Rocky Mountains, a place but little more than a year old there is a population of nearly a thousand people. The coal there is specially adapted to the making of coke of excellent quality for smelting and at the time of my visit 150 coke ovens were in constant use, turning out 1,200 tons of coke per week, while 50 additional ovens were in course of construction. The advent of the railway by which large and valuable coal deposits have been reached has been an important factor in the progress of mining industry in that region, which is advancing by leaps and bounds. Cranbrook is an older and more populous town in which a large business is done.

All along the route through the Kootenay country, the district is so mountainous and rocky that there does not appear to be much land available for agricultural purposes. From the few crops visible from the trains and the fruit trees seen growing in the gardens in some of the older towns, it was evident that in many parts of that country the climate is well adapted to the growing of agricultural crops and also of fruits of high quality. Some very fine pears, apples and plums were seen on the trees in some of the older gardens. A day was spent at Nelson and another at Rossland, both of which are now important and interesting places. In both these towns, mining is being actively pushed and the daily output of ore is very large. At Rossland the formation of the mountains is such as to resemble a large basin and part way up the steep sides of this basin at an elevation of about 3,000 feet the town is built. The railway climbs to this height by a succession of steep grades. Although only four years old this town has a population of several thousand and business of all sorts seemed to be very brisk. On the way to Rossland, Trail was passed, where there is a very large smelter which was then being worked to the fullest capacity, and the valuable metals were extracted from an enormous quantity of ore every week. On the way up the Arrow Lakes from Robson to Revelstoke, the new line of railway recently built to the eastern part of the boundary country was seen. This runs along the sides of the mountains which skirt the margin of the Arrow Lakes for about 30 miles, then turning south-westerly up the valley of Kettle Creek, is soon lost to view. Taking a sleeper from Revelstoke the journey was made to Agassiz, B.C., by about ten the following morning.

EXPERIMENTAL FARM, AGASSIZ, B.C.

The work on this branch experimental farm is making good progress. An additional area of land is cleared every year and the portions devoted to orchards and field crops are being gradually enlarged. About 140 acres are now under cultivation nearly one-half of which has been planted with fruit. A very large number of varieties of fruit have been brought together on this farm from many different countries, and as these trees come to a bearing age much useful information is gained from year to year as to the sorts best suited to the climate and most profitable to the grower.

The season of 1899 has been a most unfavourable one here for fruit. The spring was very late and rain was so frequent, with dull weather intervening all through the blossoming period that very little fruit set. Some varieties, however, of apples and plums and a few of the pears bore a partial crop, but the total yield was very disappointing. The crops of hay and oats were good, barley also has given a fair yield. The quantity of wheat grown in this province is small, but the crop was about an average one. The season was unusually cool as well as wet, which was unfavourable for Indian corn and this crop was light. Field roots gave satisfactory returns. The hedges, avenues and plantations of forest and ornamental trees had made excellent growth.

A VISIT TO THE DOUKHOBORS.

On returning east a trip was taken up the Manitoba and North-western railway from Portage la Prairie to Yorkton, and thence by vehicle nearly 100 miles to the north trail of the Swan River near Thunder Hill. Journeying then eastward for many miles the Swan was again forded and travel continued on the south trail until the Dauphin Railway was reached. During this drive of about 150 miles, many villages of the Doukhobors were passed and inquiries made as to their progress in these new settlements, in providing shelter and food for the winter and in preparing land for crop next season. At the time of my visit nearly all the able-bodied men were away from the villages working on the railways or assisting the settlers within reach in their harvesting and threshing, thus earning money to buy supplies for the winter, while some of the older men and the boys with the help of a number of the strong and active women were building houses and preparing land for crop next year. They are a very industrious people and appear to be well satisfied with the country. Most of the land in their settlements is of good quality and the locations they have chosen are more or less wooded, affording convenient supplies for building operations, and for firewood. They are all vegetarians and will not eat animal food as they consider it a sin to kill, many of them, however, will eat fish, and some of their villages are located near small lakes in which fish are abundant. They like butter, cheese and eggs, but as yet can get very little of these useful concentrated foods, as their stock of cows is so small as to give them but a meagre supply of milk, and they have very few fowls. At the time of my visit they were subsisting chiefly on dry bread made from a low grade of flour, with soup made by boiling a mixture of flour and water, with vegetables such as cabbages, onions and beets and in some instances potatoes of which they are very fond. In most of the villages considerable quantities of vegetables have been grown, but not nearly enough for the requirements of the people for the winter.

HOW THEY LIVE.

The houses of the Doukhobors are substantially built of logs, and roofed with poles, on which prairie sod about 4 inches thick is laid and the interstices filled with fine earth. The sides of the houses are well plastered on the outside with clay mixed with cut straw or hay and sometimes on the inside also with the same material. The furniture in the houses is all of their own make and consists of a few rough stools to sit on, and higher benches which serve as tables. The beds are made of a series of poplar poles about 6 feet long and 3 or 4 inches in diameter, placed close together along

one or both sides of the house, with the ends to the wall. On these some hay is placed and over this a piece of thick felt. The people recline on this structure with their heads to the wall, feet outwards using such bed clothes as they can command. A few have feather beds and curtains to divide the sleeping places into compartments. Most of the houses consist of one large room for living, cooking, eating and sleeping. The aim is to have in all their villages a house for each family, and these houses were being erected at varying distances in two rows with a wide street between them. Although new houses are going up rapidly in every village, the absence of the able bodied men necessarily interferes with the progress of this work, and in some of the villages at that time each house was occupied by from 10 to 20 people and in a few instances the inmates numbered from 25 to 40.

In these densely populated buildings the beds are arranged in a double tier the upper one being reached by a ladder. In each house there is a Russian oven similar to those used by the Mennonites in Manitoba, which serves for the warming of the building and cooking the food.

These people seem very contented and although in many instances conditions were met with, which would with us be regarded as cases of hardship, not a word of complaint was heard from any of them. They are honest, truthful and hard working, cleanly in their habits and use neither liquor nor tobacco. Being vegetarians they are at present at a disadvantage as compared with other settlers, as there is much game about their settlements with which they could easily supplement their vegetable diet with great advantage. They appear, however, to be very strong and hardy and will I believe prove a very useful class of people in the districts in which they are settled, and will soon form prosperous communities which will aid much in the development of the country. They may, however, need some assistance for a time until they can earn enough, together with the produce they can get from their land to sustain them.

THE RETURN JOURNEY.

The return was made by the Canadian Northern Railway which runs through the Dauphin country from Gladstone to Swan River. The Manitoba and North-western and the Canadian Northern are both substantially built roads, which connect with the main line of the Canadian Pacific at Portage la Prairie. Each line runs through portions of the country where much of the land is of excellent quality and the conditions are favourable for mixed farming. Settlement is proceeding rapidly and traffic is increasing and the returns are improving from year to year.

THE PARIS EXPOSITION.

Much work has been done at all the Experimental Farms in providing choice material, both in grain and fruit, for the forthcoming Paris Exposition. A large number of varieties of cereals and other agricultural products have been put up in suitable form for display both in straw and as cleaned grain.

The Central Experimental Farm has contributed 18 cases of cereals and 224 bottles of fruits preserved in antiseptic fluids, and the branch farm at Nappan, Nova Scotia, 7 boxes of grain and 214 bottles of fruit. The farm at Brandon, Man., has sent 8 cases of cereals and 81 bottles of small fruits and vegetables; Indian Head, N.W.T., has forwarded 9 boxes and 25 bags of grain and 123 bottles of vegetables and small fruits, while from Agassiz there has been sent 5 cases of grain, 188 bottles of preserved fruit and 17 cases of fresh fruit. The Experimental Farms have thus contributed materially to the magnificent display of agricultural and horticultural products which will be made by Canada on this important occasion.

ACKNOWLEDGMENTS.

To the Director of the Royal Gardens, Kew, England, grateful acknowledgments are due for another valuable collection of the seeds of trees, shrubs and plants from

many countries. Also to the Director of the Arnold Arboretum, Jamaica Plains, Mass., for seeds of rare and promising varieties. To the United States Department of Agriculture at Washington, I am indebted for a number of differert sorts of cereals, and to Prof. John Macoun, Naturalist, of the Geological and Natural History Survey, and to Mr. J. M. Macoun, Assistant Naturalist, my thanks are due for seeds of many interesting native species, gathered in different parts of Canada.

The faithful services rendered by all the officers at the Central and Branch Experimental Farms, and their earnest co-operation in carrying out the many lines of experimental work planned, are gratefully acknowledged.

My thanks are also due to those members of the staff who have rendered most efficient help in those branches of the work of which I have had personal charge: to the Horticulturist, Mr. W. T. Macoun, who has supervised the labour given to the lawns, and to the trees and shrubs planted on the ornamental grounds: to the Farm Foreman, Mr. John Fixter, who has carefully watched over the different branches of the work, taken special charge of the fertilized plots, and aided me much by his practical suggestions: to Mr. Harry Fixter, who has managed the work connected with the experimental plots of cereals, fodder crops and field roots, and has taken records of the growth and yield of all the varieties grown in the uniform test plots, to whom I am also indebted for the careful management of the many details connected with the distribution of samples of seed grain. Careful work has also been done by Mr. Wm. Ellis, in testing the vitality of seeds, in the management of the green house plants, in the propagation of many useful and ornamental species and in the taking of the meteorological records. The employees also of all the farms, in every branch of work, have shown commendable care, and have faithfully discharged their respective duties.

WM. SAUNDERS,

Director Experimental Farms.

REPORT OF THE AGRICULTURIST.

(J. H. Grisdale, B. Agr.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith reports on (1) Horses, (2) Pure-bred Breeding Stock. (3) The Dairy Herd. (4) Experiments in Beef Production. (5) Experiments in Pork Production. (6) Sheep. (7) The Farm Dairy, and (8) The 200 Acre Farm, rotation, methods of cultivation and crops thereon.

I have addressed meetings at Merivale, Shawville, Rockland, Kingston, Eastern Ontario Dairymen's Association, St. Jerome, Quebec Dairymen's Association, London, Leicester Breeders' Association, Mattawa, Carleton Place and Almonte.

I am indebted to John Fixter, farm foreman, and to R. R. Elliott, herdsman, for particularly valuable assistance, both in carrying on the work reported upon and in the preparation of the submitted report.

I have the honour to be, sir,
Your obedient servant,
J. H. GRISDALE,
Agriculturist

HORSES.

There are in the farm stables at present thirteen horses. A number of these are rather old animals and will need to be replaced at an early date. During the year two were sold and a young team bought to replace them.

Three of the above horses are required for the omnibus, which runs from the farm to the city, making three trips daily. One is used as a driver, and one for general jobbing.

The remaining eight horses constitute the teams for general work upon the farm, in the garden and orchards, upon the lawns and in the Arboretum, as well as for cartage. This number of horses has during the past year proven to be very far short of the requirements as detailed above, and it has been found necessary to hire additional teams.

PURE-BRED BREEDING CATTLE.

There are on the farm at present representatives of three breeds of cattle: Ayrshires, Guernseys, and Shorthorns. They are as follows:—

Ayrshires;

1 bull, "Matchless Again," [8,757]....................2 years old.
1 heifer, "Darling"..........................1 year 8 mos. old.

Guernseys:

1 bull, "Wedgewood," [5,113]........................5 years old.
2 bulls..1 year old.
1 heifer...1 year 9 mos.

Shorthorns:

1 bull, "Royal Don," [24,639]........ ....4 years old.

It is proposed to secure a few more females of each breed represented, and maintain small herds of these breeds.

The bulls are used upon our grade cattle, and small graded herds of each breed are to be built up. The services of the stock bulls are available to farmers upon payment of a moderate charge.

DAIRY CATTLE.

The herd of dairy cattle consists of twenty-nine females all told. They are:—

Canadian grades	5
Yearlings	5
Ayrshire and other grades	15
Calves	4

During the year no experimental work in feeding has been conducted, save that the ration being fed on my taking charge has been allowed to continue for a year, as the basis of some experimental work in feeding for increased milk production.

During the year some of the older, and less valuable, and a few younger, rather inferior, cattle have been sold to the butcher.

The dairy cows have been fed a roughage ration, of corn ensilage, 35 pounds, chaff, 3 pounds, hay, 5 pounds, and mangels, 20 pounds daily; some receiving slightly more, others, somewhat less, according to requirements. The grain ration has been from 2 to 8 pounds per diem of a mixture of equal parts of oats, pease, barley and bran. The cows when dry have received the same roughage ration with no meal, and the heifers have been fed similarly.

During the year, twenty-five cows have been milked, the number of days in lactation varying from 49 to 365, or an average of 284 days per cow. The total milk sold was 135,346 pounds, which, valued at current factory prices, amounted to $1,280.47. This makes an average of $51.22 per cow.

Valuing our feed stuffs as follows:—

Bran and meal	$15 00	per ton.
Ensilage	2 00	"
Roots (mangels)	2 00	"
Clover hay	5 00	"
Chaff	3 00	"
Pasture	2 00	per month per cow.
Dry cows	2 00	"

The cost of maintaining our herd for the year was $1,030.51 or an average of $41.22 per cow. This leaves a net average profit of $10 per cow.

The past summer has been a most trying one on our dairy herd, since it was impossible to protect them properly from sun and flies, owing to lack of shade trees in the pasture and the practical impossibility of stabling them at will during the season of excessive heat and many flies, owing to insufficient fencing.

STEERS.

During the year a number of steers have been fed experimentally to test the comparative values of certain rations, a particular description of the composition of which, and the plan of feeding the steers, follows:

Thirty-two steers were bought in October, 1898. These were fed a uniform ration of roots 25 pounds, ensilage 50 pounds, hay 5 pounds, straw 5 pounds, at the rate of 50 pounds each daily.

On December 1, they were divided into eight lots of four each. Following are statements of the treatment of each group, with data obtained in the sixteen weeks during which the experiment was continued, viz., from December 1, 1898, to March 23, 1899. On March 23, the steers were again put on a uniform roughage ration of ensilage 33 pounds, hay 8 pounds, roots 12 pounds, 6 pounds meal, equal parts oats, pease, and barley, and were kept on this ration till April 4. On this date the roots were finished and 12 to 15 pounds of ensilage was substituted. This ration was maintained till May 22, when the lot was sold at $4.60 per cwt. live weight.

Lot 1 was fed on a roughage ration of 46 pounds per steer daily, made up of the following feeds in the given proportion: Corn ensilage 50 pounds, roots 25 pounds, hay, mixed (cut) 5 pounds, oat straw (cut) 5 pounds.

During the first four weeks period no meal was fed. During the second four weeks period 2 pounds meal, equal parts oats, pease, and barley was fed daily per head. During the third four weeks period 4 pounds meal was fed daily per head. During the fourth period of four weeks 6 pounds meal was fed per head.

Lot 1.	Starting Weight.	Final Weight.	No. of Days Fed.	Total Gain.	Daily Rate of Gain.	Total Cost of Feed.	Cost of 1 Pound Gain.
4 Steers.....	4,075	4,680	112	605	1·35	$35.41	5.86 cts.

This lot cost to feed during November, $3.86, December 1 to March 23, $35.41, and from March 23 to May 22, $28.70, making a total cost of $67.97.

The net proceeds from this lot were.......	$ 217 35
Their gross cost	197 67
A net gain of..	$ 19 68

Lot 2 was fed a roughage ration of 46 pounds per diem, made up of the following feeds in the given proportion. Corn ensilage 50 pounds, roots 25 pounds, hay, mixed (cut) 5 pounds, oat straw (cut) 5 pounds. During the first four weeks no meal was fed. During the second four weeks period 2 pounds meal (half cotton seed meal and half pease, oats and barley) was fed. During the third period of four weeks 4 pounds meal (half cotton seed and half pease, oats and barley) was fed. During the fourth period of four weeks 6 pounds of meal was fed, 2 pounds cotton seed meal and 4 pounds meal, equal parts pease, oats, barley, in each case to each animal daily.

Lot 2.	Starting Weight.	Final Weight.	No. of Days Fed.	Total Gain,	Daily Rate of Gain.	Total Cost of Feed.	Cost of 1 Pound Gain.
4 Steers.....	4,080	4,648	112	568	1·27	$36.89	6·50 cts.

This lot cost to feed during November, $3.86, December 1 to March 23, $36.89, and from March 23 to May 22, $28.70, making a total cost of $69.45 for feed.

The net proceeds from this lot were....................	$217 78
The gross cost was.....................................	199 15
A net gain of..	$18 63

Lot 3 was fed a roughage ration of 46 pounds per diem, made up of the following feeds in the given proportion :—Corn ensilage, 50 pounds ; roots, 25 pounds; hay, mixed

(cut) 5 pounds; oat straw (cut) 5 pounds. During the first period of four weeks no meal was fed. During the second four weeks period 2 pounds meal (half oil cake and half pease, oats and barley equal parts) was fed. During the third four weeks period 4 pounds of the same mixture was fed to each animal daily. During the fourth four weeks period 6 pounds per steer was fed of a mixture of 2 pounds oil meal to 4 pounds of a mixture of oats, pease and barley equal parts.

Lot 3.	Starting Weight.	Final Weight	No. of Days Fed.	Total Gain.	Daily Rate of Gain.	Total Cost of Feed.	Cost 1 lb. Gain.
4 Steers	4,080	4,720	112	640	1·43	$37.28	5·82 cts.

This lot cost to feed during November, $3.86, December 1 to March 23, $37.28, and from March 23 to May 22, $28.70, making a total cost of $69.84 for feed.

The net proceeds for this lot were	$214 59
The gross cost was	200 70
A net gain of	$13.89

Lot 4 was fed a roughage ration of 46 pounds per diem, made up of the following feeds in the given proportion :—Corn ensilage, 50 pounds ; roots, 25 pounds ; hay, mixed (cut) 5 pounds ; oat straw (cut) 5 pounds. During the first period of four weeks no meal was fed. During the second four weeks period 2 pounds, meal (half corn and half pease, oats and barley, equal parts) was fed daily per steer. During the third period of four weeks 4 pounds of the same mixture was fed, aud 6 pounds during the fourth four weeks period.

Lot 4.	Starting Weight.	Final Weight.	No. of Days Fed.	Total Gain.	Daily Rate of Gain.	Total Cost o Feed.	Cost 1 lb. Gain.
4 Steers.....	4,090	4,747	112	657	1·47	$35 60	5·42 cts.

This lot cost to feed during November $3.86, December 1 to March 23, $35.60, and from March 23 to May 22, $28.70, making a total cost of $68.16 for feed.

The net proceeds for this lot were	$219 37
The gross cost was	199 51
A net gain of	$19 86

Lot 5 was fed a roughage ration of 46 pounds per diem, made up of the following feeds in the given proportion :—Corn ensilage, 50 pounds ; roots, 25 pounds ; hay, mixed (cut) 5 pounds ; oat straw (cut) 5 pounds. During the first period of four weeks no meal was fed. During the second four weeks period 3 pounds of meal (half corn and half bran) was fed each steer daily. During the third four weeks period 4 pounds of the same mixture was the daily ration per steer, and 6 pounds daily per steer during the fourth four weeks period.

Lot 5.	Starting weight.	Final weight.	No. of days fed.	Total gain.	Daily rate of gain.	Total cost of feed.	Cost of one pound gain.	Cost to feed 1 steer 1 day.
4 Steers	4,095	4,715	112	615	1·38	$34.82	5·66 cts.	7·77 cts.

Ayrshire Heifer 'Darling,' (yearling)—Central Experimental Farm, Ottawa.

Guernsey Bull 'Wedgewood,' 5 years old, Central Experimental Farm, Ottawa.

Leicester Ram 'Laurier,' (Shearling.)—Central Experimental Farm, Ottawa

This lot cost to feed during November, $3.86, December 1 to March 23, $34.82, and from March 23 to May 22, $28.70, making a total cost of $67.38 for feed.

The net proceeds for this lot were	$ 218 13
The gross cost was	198 73
A net gain of	$ 19·40

Lot 6 was fed a roughage ration of 46 pounds per diem, made up of the following feeds in the given proportion :—Corn ensilage, 50 pounds ; roots, 25 pounds ; hay, mixed (cut) 5 pounds ; oat straw (cut) 5 pounds. During the first period of four weeks no meal was fed. During the second four weeks period 2 pounds of meal (equal parts cotton seed meal, oil cake, cornmeal and bran) was fed per steer daily. During the third four weeks period 4 pounds of the same mixture, and 6 pounds during the fourth four weeks period was fed daily to each steer.

Lot 6.	Starting weight.	Final weight.	No. of days fed.	Total gain.	Daily rate of gain.	Total cost of feed.	Cost of one pound gain.	Cost to feed 1 steer 1 day.
4 Steers........	4,095	4,655	112	560	1·25	$35.08	6·26 cts.	7·83 cts.

This lot cost to feed during November, $3.86, December 1 to March 23, $35.08, and from March 23 to May 22, $28.70, making a total cost of $67.64 for feed.

The net proceeds for this lot were	$215 69
The gross cost was	198 00
A net profit of	$ 17 69

Lot 7 was fed a roughage ration of 46 pounds per diem per steer, made up of the following feed in the given proportion :—Corn meal 50 pounds; hay, mixed (cut) 5 pounds; oat straw (cut) 5 pounds. During the first period of four weeks no meal was fed. During the second period 2 pounds meal (half corn meal and half pease, oats and barley equal parts) was fed to each animal daily. During the third four weeks period 4 pounds of the same mixture, and 6 pounds during the fourth four weeks period was fed daily to each steer.

Lot 7.	Starting weight.	Final weight.	No. of days fed.	Total gain.	Daily rate of gain.	Total cost of feed.	Cost of one pound gain.	Cost to feed 1 steer 1 day.
4 Steers......	4,100	4,685	112	585	1·30	$32.07	5·46 cts.	7·16 cts.

This lot cost to feed during November, $3.86, December 1 to March 23, $32.07, and from March 23 to May 22, $28.70, making a total of $64.63 for feed.

The net proceeds for this lot were	$217 85
The gross cost was	194 50
A net gain of	$ 23 35

Lot 8 was fed night and morning with 30 pounds of a mixture of corn ensilage and oat straw in the proportion of 10 to 1, while at noon they received 25 pounds roots and 5 pounds log hay. During the first four weeks period no meal was fed. During the second period of four weeks 1 pound meal (half cotton seed meal and half oats, pease and

barley) was fed to each steer daily. During the third four weeks period 2 pounds of the same mixture, and 4 pounds during the fourth four weeks period was fed daily to each steer.

Lot 8.	Starting weight.	Final weight.	No. of days fed.	Total gain.	Daily rate of gain.	Total cost of feed.	Cost of 1 lb.	Average cost to feed steer 1 day.
4 Steers.	4,115	4,725	112	610	1·36	$36.87	6·04 cts.	8·23 cts.

This lot cost to feed during November, $3.86, December 1 to March 23, $36.87, and from March 23 to May 22, $28.70, making a total cost of $69.43.

The net proceeds of this lot were	$ 216 00
The gross cost was	200 78
A net gain of	$15 22

SPRING STEER FEEDING.

On February 21, twenty steers were bought in, and on March 29, nine more were purchased. These steers were fed on ensilage and long hay for roughage and a meal ration of oats, pease and barley. The twenty-nine steers made a gain of 5,825 pounds during the period fed, or a daily average gain of 2·06 pounds.

Cost of steers	$ 874 00
Cost of meal consumed	80 00
Value of roughage fed	125 60
Gross cost	$ 1,079 60
Net proceeds of sale	$ 1,094 34
	1,079 60
Net gain	$14 74

These lots of steers were fed for the special purpose of making a market for a large amount of ensilage and clover hay which would otherwise have been on hand during the summer, and would thus have lost considerably in value, as well as been an inconvenience. By thus feeding this roughage, considerable valuable and necessary manure is at our command.

EXPERIMENTS FOR 1900.

During the past autumn 77 steers have been purchased. The average cost has been $3.47 per cwt. live weight. These are being fed experimentally, the chief objects in view being (1) a dehorning test, (2) a comparison of three year olds, two year olds and yearlings as economical beef producers, and (3) a test of tied versus loose fed steers as economical flesh producers.

DEHORNING STEERS.

To gain some information as to the exact cost of dehorning steers in loss of flesh due to excitement, loss of blood, and pain caused by operation, an experiment along this line has been conducted.

The steers, twenty-two in number, all two year old, were placed as follows:

Lots. Nos. 2 and 3, of nine each, were tied in two rows (1 lot in each) facing each other. Lot No. 4, of nine steers, was loose in a box stall 36 by 15 ft.; Lot No. 6, of nine steers, was tied in a separate building; and Lot No. 7, of six steers, was loose in a box stall 24 by 14 ft.

Lots. Nos. 3 and 4, and half of Lot No. 7 were dehorned November 16. The saw was used on six of them, three in each of Lots. Nos. 3 and 4; the Keystone Clipper on six more, three in each of Lots. Nos. 3 and 4; the large double-action, straight cut clipper on six more, three in each of Lots. Nos. 3 and 4; and the single-action straight cut on three in Lot No. 7.

The dehorned cattle, as well as those in Lot No. 2, were weighed daily for a time. The following are the gross weights recorded:—

Lot.	Treatment.	Gross Weight of Lots.					
		November.					December.
		16	17	18	20	28	5
2	Tied, not dehorned facing 3.....	8,905	8,715	8,525	8,595	8,580	8,915
3	Tied, dehorned..............	8,655	8,470	8,370	8,360	8,415	8,630
4	Loose, dehorned..............	8,340	8,300	8,270	8,315	8,400	8,540
6	Tied, not dehorned...........	7,700	Not	Not	Not	7,825	7,865
7	3 dehorned steers loose with	2,420	weighed.	weighed.	weighed.	2,350	2,395
7	3 hornless steers	2,730	"	"	"	2,752	2,795

It will be observed that Lot No. 2, though not dehorned, lost in weight. This might be ascribed to their position facing Lot No. 3, as they suffered from excitement as much almost as the dehorned lot.

Lots Nos. 2 and 3, it will be observed, recovered their original weight about the same date.

Lot No. 4, took only six days to recover from the operation, for on November 21, they weighed 8,345 pounds, 5 pounds above their weight on November 10.

The check lot in the separate stable, designated Lot No. 6, was not weighed daily, but made slow, steady progress.

The dehorned steers in Lot No. 7, lost considerable weight and did not finally recover till December 20. This was doubtless due to their being loose with the other steers, which were not sore, and besides were larger steers. These latter, it will be observed, made some gain.

While no positive conclusions may be reached as to the exact cost of dehorning, it would appear from a comparison of Lot No. 2, with Lot No. 4; of Lot No. 4, with Lot No. 6; and of dehorned part of Lot No. 7 with hornless part of the same lot, that no great setback is suffered by steers from this operation. It was observed that nervous, irritable individual animals were much more affected than sluggish, phlegmatic ones. It must be remembered that all these steers had just been stabled, and so would, of course be making very little progress in any case during this period.

No great difference was observable in the effect of the different instruments used in dehorning, save that there was practically no blood lost where the saw was used.

One anial in lot No. 3, dehorned with the Keystone Clippers lost a great deal of blood, but inno other case was there any serious bleeding.

STEER CALVES

An exeriment with calves is being incepted. Ten calves, Shorthorn grades, divided into two eqal lots, will be fed: Lot 1, a good growing ration; Lot 2, a ration sufficient

to keep the calves in high condition from the first. It is desired to ascertain (1) the comparative economy of these systems, and (2) the actual cost of raising a steer to the age of two years, (*a*) ready for the block, (*b*) ready to feed, under such conditions as maintain in this latitude.

SHEEP.

In April, it was decided to introduce sheep upon the farm, and the following is the sum of the flocks at present.

Leicesters:	1 ram	1 year old.
	1 ewe	2 years.
	3 ewes	shearlings.
	3 lambs	8 months.
Shropshires:	1 ram	1 year old.
	4 ewes	shearlings.
	4 "	lambs (8 mos.)
Grades:	10 "	shearlings.
	8 "	lambs (8 mos.)

Two of the Shropshire shearlings were imported from England, the remaining pure-breds, both Shropshire and Leicester, were bought in Canada. The grades were secured from a city butcher, and were selected as the average of large lots intended for the block.

Since the space available for sheep is at present very limited, it was possible to keep only two flocks. The Shropshire and Leicester were accordingly selected as being fairly typical representatives of the short and long woolled breeds.

It is hoped that a few more breeds may in time be introduced.

In most parts of Canada the sheep bred by the average farmer are of a very inferior class. Further, in many sections, especially suited for the profitable production of mutton and wool, very few or no sheep are raised, owing, in many cases, to uncertainty as to the possibilities of this class of animals as money-makers. It is proposed, therefore, to show, by the use of pure-bred rams upon grade ewes, the advisability of using good sires to improve our flocks, and the superiority of well-graded flocks over scrubs as money producers, as well as to help the introduction of this class of live stock into more general favour.

It is desired also to gain some data as to the cost of fitting lambs and shearlings for our markets, foreign and domestic, as well as to study the quality of mutton best suited for the same.

The study of the value of sheep as enrichers of the soil will also enter into this work, and their value as weed destroyers be tested to a certain extent.

PIGS.

At present the stock of breeding pigs consists of the following pure-bred animals :—

Large Improved Yorkshires	1 boar	3 years old.
	1 sow	1 year "
	2 sows	9 months old.
Improved Berkshires	1 boar	1½ years "
	1 sow	3 " "
	1 "	1½ " "
Tamworths	1 boar	2 " "
	1 sow	3 " "
Poland Chinas	1 boar	2 " "
	1 sow	1½ " "
	1 "	8 months

There are besides nineteen cross-bred pigs of our own breeding about three months old, which are to be fed off experimentally.

BREEDING

For some years past experimental work has been carried on in cross-breeding. This line, it is now intended to discontinue for a time, and its place will be taken by work in "grading up."

EXPERIMENTAL FEEDING.

During the year a number of swine have been fed experimentally for the purpose of: (*a*) discovering the cause or causes of "soft" pork; (*b*) contrasting ground with whole grain as an economical pork producer; (*c*) studying the economy of a limited grain ration as compared with an unlimited one; and (*d*) studying the effect of "finishing" on rape and roots upon: (1) economy of pork production; (2) quality of flesh.

Part of the data from (*a*) and the whole of that from (*b*) and (*c*) have appeared in Bulletin No. 33, recently issued by this division.

An extensive experiment for the purpose of discovering the cause or causes of "soft" pork was begun in July, and is still in progress. This will be reported upon later.

Below are the details of, and data obtained from an experiment recently completed.

FEEDING PIGS ON RAPE.

On August 2, 1899, two lots of six pigs each were placed on a rape plot of about $\frac{1}{4}$ acre. This rape had been sowed in drill on May 20, but owing to wet weather, had made rather poor growth, and so was only about 15 inches high at date of turning in the pigs. For some time after their introduction they failed to eat much of the crop, especially the younger lot. Very little grain was given, however, and finally both lots fed heartily upon the juicy young plants. The growing rape was pretty well eaten down by October 1, and from that date till November 30, an allowance of 4 pounds of rape per pig was fed daily from another field. The five remaining after November 30, received as much mangolds as they would eat, about 4 pounds each, daily.

The following table gives the particulars as to increase and the daily rate of gain:—

Lot No. 1.	First Weight.	Last Weight.	Gain.	Days Fed.	Daily Rate of Gain.	Remarks.
No 81	59	176	117	119	·97	Pure bred Chester White.
82	68	190	121	119	1·02	"
83	56	180	124	119	1·04	"
84	64	190	126	119	1·06	"
85	76	191	115	119	·97	Poland China.
90	59	173	114	119	·96	"
Total ...	383	1,100	717	119	*1·004	

* Average rate of gain.

Lot No. 2.	First Weight.	Last Weight.	Gain.	Days Fed.	Daily Rate of Gain.	Remarks.
No. 86	32	165	133	148	·90	Grade Yorks.
87	32	190	158	148	1·07	"
88	30	161	131	148	·89	"
89	38	170	132	148	·90	"
9[illegible]	54	202	148	148	1·00	"
[illegible]	30	45	15	... .	....	Died September 6.
Total.	216	923	717	148	* ·95	

* Average rate of gain.

One pig in lot No. 2 died after being fed for thirty-five days. The pigs in lot No. 2 appeared to be too young to introduce upon rape, as they did not thrive for about a month after being confined in the lot. The dew and moisture from the plants seemed to affect them, causing their skin to crack. Lot No. 1 was not affected in this way.

Below is a statement of cost and proceeds of eleven finished hogs :—

Eleven pigs at $2, average	$22 00
Rent of lot	2 00
3,000 pounds rape and roots at $2 per ton	3 00
4,402 pounds meal at $1 per cwt	44 02
	$71 02
Proceeds of 1,988 pounds of pork at $4.50 per cwt	$89 46
Net profit	18 44

It was, of course, impossible to determine the quantity of rape grown on the lot, so a rental of $2 is charged for the one-quarter acre.

Below is a statement of the results and criticisms at the Geo. Matthews Co. packing house, Hull, Que. :—

Pig No.	Live Weight.	Dressed Weight.	Per cent Dressed.	Date of Killing.	Yard Criticism.	Quality of Pork.
81	176	128	72·7	Nov. 30....	Straight..	Poor.
82	190	136	71·6	" 30....	"	Fair.
83	180	133	73·9	" 30 ...	"	Very poor.
84	190	136	71·6	" 30....	"	"
85	191	144	75·4	" 30....	"	Fair.
90	173	125	72·2	" 30....	Short......	Poor.
86	165	125	75·7	Dec. 29 ..	Straight......	Good.
87	190	137	72·1	" 29....	"	Very good.
88	161	118	73·3	" 29....	"	"
89	170	121	71·2	" 29....	"	"
91	202	147	72·7	" 29....	"	Good.

The date of killing is given in each case, since, though all were treated in the same way till November 30, after that date the remaining pigs were fed roots instead of rape. It will be observed that the lot killed December 29, were all firm in quality, any one of them being superior to the best in Lot No. 1, killed November 30.

COST OF PRODUCING PORK.

The two lots produced in all 1,434 pounds of pork during the period of the experiment. The cost of feed was $49.02, thus making the cost of 100 pounds increase $3.42. This being very materially less than the average cost of producing pork on gain alone is thus of considerable interest. Had the pigs been from earlier litters a still lower cost per pound increase would doubtless have been the result, since the cold weather necessitated a larger grain ration.

THE DAIRY.

It is aimed to make the dairy in connection with the dairy herd such as might be of use as a model for any farmer desirous of carrying on a private dairy enterprise. A new turbine separator was put in this year and is giving satisfaction. The other appliances are older, but are suited to the work in hand. The refrigerator chamber has been recently remodelled upon the most approved and scientific plans.

The work carried on is the testing of home dairy appliances to a limited extent, the testing of samples of milk, cream, etc., sent in from time to time, and the carrying on of experimental work in pasteurizing, ripening and churning cream. All this is subordinate, however, to the manufacturing of the farm milk produce into butter. During the year 135,346 pounds of milk was handled.

THE FARM.

It was decided in the early part of the year that some 200 acres of land be set apart to be managed, so far as our peculiar circumstances will permit, just as any other farm of similar proportions might be managed. Below will be found a report of the treatment, and of the crops upon this 200 acres.

SOIL.

The land included in this area has been, heretofore, under no regular rotation of crops and is of a varied character indeed. No particular kind of soil may be said to constitute the principal part of the area. Some of the varieties well represented are, blue clay, white clay, loamy clay, clayey loam, loam, sandy loam, loamy sand, red sand, white sand, gravel and muck. Much of the sub-soil is a clayey hard-pan, lying from 1 to 30 inches below the surface.

ROTATION.

The whole 200 acres has been divided into five lots of about 40 acres each. These will in turn be under similar crops, thus making up a regular rotation of five years duration. The first year might be said to be pasture; the second, pease, and oats and pease mixed, seeded with clover; the third, corn, potatoes and roots; the fourth, cereal crops of oats, barley and wheat and seeded down with Timothy and clover; the fifth, meadow.

Below is a diagrammatic representation of the rotation with the successive crops indicated on the different plots.

1899—Pasture. 1900—Pease, mixed crop seeded to clover. 1901—Corn, roots, &c. 1902—Cereal crop, seeded down. 1903—Hay. 1904—Pasture, &c.	1899—Hay. 1900—Pasture. 1901—Pease, mixed crops, seeded to clover. 1902—Corn, roots, &c. 1903—Cereal crop, seeded down. 1904—Hay.
1899—Pease, mixed crop, seeded to clover. 1900—Corn, roots, &c. 1901—Cereal crop, seeded down. 1902—Hay. 1903—Pasture. 1904—Pease, mixed crop, seeded to clover, &c.	1899—Corn, roots, &c. 1900—Cereal crop, seeded down. 1901—Hay. 1902—Pasture. 1903—Pease, mixed crop, seeded to clover. 1904—Corn, roots, &c.
1899—Cereal crop, seeded down. 1900—Hay. 1901—Pasture. 1902—Pease, mixed crop seeded to clover. 1903—Corn, roots, &c. 1904—Cereal crop, seeded down, &c.	

CULTIVATION.

The sod or pasture land is ploughed in July and August, a shallow furrow of not over 4 inches being turned. Depending upon the weather, this is at once rolled or

disc-harrowed. During the remainder of the summer it is cultivated at intervals with the broad share cultivator, to destroy weeds and aid in the decomposition of the sod.

The succeeding spring it is cultivated and sown to pease, and mixed crop with clover.

Immediately after harvest, it is gang ploughed and kept free of weeds till late autumn by use of harrow and cultivator.

Corn, potatoes, and roots follow the next spring, the land having been manured the preceding autumn or during the winter.

Previous to sowing the corn, potatoes and roots in the spring, the subsoil is stirred by means of a deep cutting cultivator, which loosens the soil to a depth of about 8 inches.

After the harvesting of the corn, potatoes, &c., the land is put in narrow drills instead of being ploughed. In the case of corn land, the drills are about 21 inches apart, and thus contain the rows of corn and roots in alternate drills. This may be done most rapidly by using the double mould board plough.

The drills are broken down the next spring, by the disc harrow or spring tooth cultivator and the land put under oats, barley and wheat, and seeded down with a mixture of Red clover, Alsike clover, and Timothy.

After the crop of hay has been cut the succeeding summer, the cattle are turned upon it.

Shallow ploughing will, as is quite evident, retain the humus near the surface of the soil, so rendering it easily and quickly available to the young plants, as well as keeping it where it will best serve the most useful ends, of conserving soil moisture and improving the physical conditions of the soil. The use of the deep cutting cultivator will loosen the upper subsoil, and allow any surplus water to sink and the deeper growing roots to penetrate at will.

DRAINING.

Much of the 200 acre section is low lying land, with very poor natural drainage either by flow or percolation. It has been decided to supplement these and the already existing tile drains by a complete system of underground drains. With this end in view, a large main drain, 12 inches in diameter, was put down the past autumn and some progress made in the laying of the lesser mains and laterals. This work will, it is expected, be continued until all the low parts have been properly drained.

MEADOWS.

Owing to insufficient drainage, a large proportion of the clover was winter-killed, thus rendering our hay crop rather light. The quality was excellent, however, and we succeeded, in spite of adverse weather conditions, in saving it in good condition.

THE PASTURE.

One lot of 40 acres, as indicated in the diagram, was used for pasture during the past season. This section had been down to hay for 2 years, and so did not afford very good feed for our dairy stock. To this disadvantage was added the unfavourable character of the season, the large rain-fall in July rendering about one-quarter of the whole section valueless.

THE GRAIN CROPS.

Wheat: Only three varieties were grown this year. Detailed reports are as follows:

Preston.—1 acre. The soil was a heavy sandy loam, partly clay, of good quality, manured in the autumn of 1894 with about 18 tons of barn-yard manure per

acre. No fertilizer had been applied subsequently. The previous crop was sunflowers and English Horse beans. It was ploughed in the autumn of 1898 about 8 inches deep, and the following spring it was disc-harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown April 29, 1½ bushels per acre; came up May 7, and was ripe August 3. The time to mature was 96 days. Yield per acre, 24 bushels 31 pounds; weight per bushel, 60½ pounds. Length of head, 3¼ to 3½ inches; bearded; length of straw, 40 to 46 inches. Growth, medium to strong; all standing well. There was no smut, but a small amount of rust.

Percy.—1 acre. This and the next plot were adjoining Preston. The soil was similar, and so were the preparation and treatment of the land. Sown, April 29, 1½ bushels per acre; came up May 7, and was ripe August 7. The time to mature was 100 days. Yield per acre, 21 bushels; weight per bushel, 57¾ pounds; length of head, 3 to 3½ inches; beardless; length of straw, 38 to 44 inches. Growth medium to strong; all standing well. There was no smut, and very little rust.

Stanley.—2 acres. Sown April 29, 1½ bushels per acre; came up May 7, was ripe August 7. The time to mature was 100 days. Yield per acre, 20 bushels 40 pounds, weight per bushel, 60½ pounds. Length of head, 3 to 3¼ inches; beardless; length of straw, 40 to 42 inches. Growth, medium and even; all standing well. There was no smut, and very little rust.

MIXED CROPS.

Mixture composed of oats 1½ bushels, pease ¾ bushel per acre. Mixed crop, 6¼ acres. Soil, a sandy loam of fair quality, a part of it peaty. The previous crop was oats. The land received an application of barn-yard manure of about 10 tons per acre in the spring of 1898. Ploughed in the autumn of 1898 about 8 inches deep, and disc-harrowed once the following spring, and harrowed twice with the smoothing harrow before sowing. Sown May 12, 2¼ bushels per acre; came up May 24, and was ripe August 15. The time to mature was 95 days. Yield per acre, 33 bushels 22 pounds. Heads large; straw very heavy, but very badly rusted. Grain very light.

FIELD CROPS OF OATS.

The following are detailed reports of the different varieties of oats grown upon the 200 acre farm:—

Fifteen sorts were grown as field crops, covering 46¾ acres in all The soil of these fields varied much in quality, which has materially affected the relative yields per acre.

Golden Giant.—3½ acres. The soil was a sandy loam of fair quality. The previous crop was corn. The land was manured in the spring of 1898 with about 12 tons of barn-yard manure per acre. It was ploughed late in the autumn of 1898 about 8 inches deep, and the following spring it was disc harrowed once and harrowed twice with the smoothing harrow before sowing.

Sown April 26, 2 bushels per acre; came up May 4, and was ripe August 14. The time to mature was 110 days. Yield per acre, 50 bushels 3 pounds, weight per bushel, 37 pounds; length of head, 9 to 11 inches sided; length of straw, 48 to 52 inches. Made a strong and even growth; standing fairly well. There was no smut, the leaves and stems were badly rusted.

Banner.—3½ acres. This variety was sown adjoining the Golden Giant; the quality of the soil and the preparation and treatment of the land was the same. Sown, April 28, 2 bushels per acre; came up May 7; ripe, August 2. The time to mature was 96 days. Yield per acre, 61 bushels 12 pounds; weight per bushel, 35¾ pounds; length of head, 9 to 11 inches, branching; length of straw, 48 to 54 inches. Growth,

strong and even; standing fairly well. There was no smut, but the leaves and stems were badly rusted.

Improved Ligowo :—6½ acres. This also was adjoining the Golden Giant, and the character and treatment of the land was similar. Sown April 28, 2 bushels per acre; came up May 7, and was ripe August 1. The time to mature was 95 days. Yield per acre, 55 bushels 3 pounds; weight per bushel, 35¾ pounds; length of head, 8 to 10 inches, branching; length of straw, 48 to 54 inches. Made a strong and even growth; was considerably lodged, although straw fairly strong. There was no smut, but the leaves and stems were badly rusted.

Golden Beauty.—Soil, a sandy loam of fair quality, with patches of heavier soil, which were partly clay. This land received a dressing of about 15 tons of barn-yard manure per acre in the spring of 1897. No fertilizer had been applied subsequently, but a heavy sod had been ploughed under in the spring of 1899. This plot had been sown with permanent pasture mixture in the spring of 1898, with barley as a cover crop. The land was ploughed in the spring and disc harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown May 5, 2 bushels per acre; came up, May 12, and was ripe August 3. The time to mature was 90 days. Yield per acre 57 bushels 3 pounds; weight per bushel, 35½ pounds; length of head, 7 to 10 inches, branching; length of straw, 48 to 54 inches; made a strong, even growth, standing fairly well; few spots lodged. There was no smut, but the leaves and stems were slightly rusted.

American Beauty.—5 acres. This was adjoining the 3½ acres of Golden Beauty, and the character and treatment of the land were similar. Sown May 5, 2 bushels per acre; came up May 12, and was ripe August 3. The time to mature was 90 days. The yield per acre was 45 bushels 25 pounds; weight per bushel, 34 pounds; length of head, 8 to 10 inches; branching; length of straw, 48 to 52 inches. Growth strong and even. Standing fairly well, few spots lodged. There was no smut, but the leaves and straw were considerably rusted.

Bavarian.—4 acres. The soil was a sandy loam of fair quality, which was manured in the spring of 1896 with about 10 tons of barn-yard manure per acre. The previous crop was 2 acres clover, 1 acre Brome grass, 1 acre permanent pasture mixture. This was not ploughed in the autumn, but was ploughed about 4 inches deep in the spring of 1899, and disc harrowed once and harrowed three times with the smoothing harrow before sowing. Sown May 6, 2 bushels per acre; came up May 12, and was ripe August 8. The time to mature was 94 days. Yield per acre, 40 bushels 19 pounds; weight per bushel, 30 pounds; length of head, 9 to 10 inches; branching; length of straw 48 to 50 inches. Part of plot made a strong, even growth, some was considerably lodged. There was no smut, but leaves and stems were badly rusted.

Wallis.—3½ acres. The soil was a sandy loam of fair quality, which was manured in the spring of 1896 with about 10 tons of barnyard manure per acre. The previous crop was clover. This was not ploughed in the autumn, but was ploughed about 4 inches deep in the spring of 1899, and disc harrowed once, and harrowed three times with the smoothing harrow before sowing. Sown May 6, 2 bushels per acre; came up May 12, and was ripe August 8. The time to mature was 94 days. Yield per acre, 41 bushels 29 pounds; weight per bushel, 30 pounds; length of head, 9 to 11 inches, branching; length of straw, 48 to 50 inches. Growth, strong and even, and was considerably lodged. There was no smut, but the leaves and stems were considerably rusted.

Abundance.—3 acres. Soil, part clay loam, part sandy loam, and part peaty. This land was manured in the spring of 1896 with about 12 tons of barn-yard manure per acre. Half of field in autumn 1898, and balance in spring of 1899, thick mats of clover were ploughed under. The previous crop was barley, with which the clover was sown

at the rate of 10 pounds of seed per acre. Half of each plot was ploughed in the autumn of 1898, balance of field was ploughed in the spring of 1899, disc harrowed once, and harrowed twice with the smoothing harrow before sowing. Sown May 6, 2 bushels per acre, came up May 13, and was ripe August 8. The time to mature was 94 days. Yield per acre, 41 bushels 31 pounds; weight per bushel, 34½ pounds; length of head, 8 to 9 inches, branching; length of straw, 40 to 42 inches; growth, strong and even, and was considerably lodged. There was no smut, but the leaves and stems were slightly rusted.

Salines.—1 acre. This and the five following plots were adjoining that of Abundance. The soil was similar, and the preparation and treatment of the land the same. Sown, May 6, 2 bushels per acre; came up May 13, and was ripe August 14. The time to mature was 100 days; yield per acre, 27 bushels 17 pounds; weight per bushel 25½ pounds; length of head, 9 to 11 inches branching; length of straw, 40 to 46 inches. Growth, strong and even, and all standing well. There was no smut, but the leaves and stems were badly rusted.

Columbus.—1 acre. Sown, May 6, 2 bushels per acre; came up, May 14, and was ripe August 11. The time to mature was 99 days. Yield per acre, 35 bushels 15 pounds; weight per bushel, 32 pounds; length of head, 8 to 10 inches, branching; length of straw, 40 to 46 inches. Made a medium growth, straw considerably broken down. There was some smut, and the leaves and stems were slightly rusted.

Black Tartarian.—1 acre. Sown, May 6, 2 bushels per acre; came up, May 13, and was ripe August 12. The time to mature was 98 days. Yield per acre, 23 bushels 3 pounds; weight per bushel, 23 pounds; length of head, 9 to 11 inches, branching; length of straw, 46 to 54 inches. Growth, strong and even, and all standing well. There was no smut, but the leaves and stems were very badly rusted.

California Prolific, Black.—1 acre. Sown, May 6, 2 bushels per acre; came up, May 13, and was ripe August 12 The time to mature was 98 days. Yield per acre, 20 bushels 30 pounds; weight per bushel, 23 pounds, length of head, 9 to 11 inches, branching; length of straw, 46 to 52 inches. Growth strong and even, all standing well. There was no smut, but the leaves and stems were badly rusted.

Joanette.—2 acres. Sown, May 6, 1¾ bushels per acre; came up, May 13, and was ripe August 14. The time to mature was 100 days. Yield per acre, 42 bushels 17 pounds, weight per bushel 29¾ pounds; length of head, 7 to 9 inches, branching; length of straw, 33 to 40 inches. Growth, strong and even, and all standing well. There was no smut, but the leaves and stems were badly rusted.

Siberian.—4 acres cut green. Sown, May 7, 2 bushels per acre; came up, May 13, and was ripe August 11. The time to mature was 97 days. The yield per acre was 42 bushels; weight per bushel, 36 pounds; length of head, 9 to 10 inches, branching; length of straw, 44 to 50 inches. Made a strong, even growth, all standing well. There was no smut, but the leaves and stems were slightly rusted.

White Schonen.—3 acres. Soil a sandy loam of fair quality. The previous crop was oats. The land received an application of barn-yard manure of about 10 tons per acre in the spring of 1898. The land was ploughed in the autumn of 1898 about 8 inches deep, and disc-harrowed once the following spring, and harrowed twice with the smoothing harrow before sowing. Sown, May 12, 1¾ bushels per acre, came up, May 20, and was ripe August 14. The time to mature was 93 days. The yield per acre was 32 bushels 5 pounds; weight per bushel 24½ pounds; length of head, 8 to 10 inches, branching; length of straw, 44 to 50 inches. Made a strong, even growth; all standing well. There was no smut, but the leaves and stems were considerably rusted.

FIELD CROPS OF BARLEY.

Six varieties of barley were grown, occupying $11\frac{1}{2}$ acres in all. Below is a detailed report of the same :

Canadian Thorpe.—2 rowed, 1 acre. Soil a sandy loam, rather light, of poor quality ; received a coating of barn-yard manure of about 12 tons per acre in the spring of 1895. No manure or other fertilizer has been applied since, except two good crops of green clover, which had been sown with previous crops. The previous crop was oats. The land was ploughed in the spring about 4 inches deep, when a good mat of clover was turned, under and harrowed 8 times with the smoothing harrow before sowing. Sown, May 10, 2 bushels per acre ; came up, May 21, and was ripe August 8. The time to mature was 89 days. Yield per acre, 28 bushels 21 pounds : weight per bushel, $52\frac{1}{4}$ pounds ; length of head, 3 to $3\frac{1}{2}$ inches ; length of straw, 36 to 42 inches. Growth, strong and even ; all standing well. There was no smut, but the leaves and stems were slightly rusted.

Sidney.—2 rowed, 1 acre. This and the four following plots were adjoining that of Canadian Thorpe. The soil was similar and the preparation and treatment of the land the same. Sown' May 10, 2 bushels per acre ; came up May 21, and was ripe August 7. The time to mature was 88 days. Yield per acre, 32 bushels 14 pounds ; weight per bushel, 51 pounds ; length of head, $3\frac{1}{2}$ to 4 inches ; length of straw, 36 to 42 inches. Growth strong and even ; standing fairly well. There was no smut ; leaves and stems were slightly rusted.

Champion.—1 acre. Sown, May 10, $1\frac{3}{4}$ bushels per acre ; came up, May 21, and was ripe August 6 The time to mature was 87 days. Yield per acre, 23 bushels 11 pounds, weight per bushel, $43\frac{1}{4}$ pounds ; length of head, 3 to $3\frac{1}{4}$ inches, beardless ; length of straw, 36 to 42 inches. Growth, medium to weak ; all standing well. There was no smut, but the leaves and stems were slightly rusted.

Trooper.—6 rowed 1 acre. Sown, May 10, $1\frac{3}{4}$ bushels per acre ; came up, May 21, and was ripe August 8. The time to mature was 89 days. Yield per acre, 24 bushels 25 pounds ; weight per bushel, $52\frac{1}{2}$ pounds ; length of head, $2\frac{3}{4}$ to 3 inches ; length of straw, 30 to 36 inches. Growth uneven, weak ; all standing. There was no smut, but the leaves were slightly rusted.

Royal.—6 rowed, 1 acre. Sown, May 10, $1\frac{3}{4}$ bushels per acre ; came up, May 21, and was ripe August 7. The time to mature was 88 days. Yield per acre, 24 bushels 5 pounds ; weight per bushel, 51 pounds ; length of head, 3 to $3\frac{1}{4}$ inches ; length of straw, 36 to 42 inches. Growth even, medium to weak ; all standing well. There was some smut, and leaves and stems were slightly rusted.

Mensury.—$6\frac{1}{2}$ acres. Sown, May 10, $1\frac{3}{4}$ bushels per acre ; came up, May 21, and was ripe August 7. The time to mature was 88 days. Yield per acre, 40 bushels 11 pounds ; weight per bushel, $52\frac{1}{4}$ pounds ; length of head, $3\frac{1}{4}$ to $3\frac{1}{2}$ inches ; length of straw, 42 to 44 inches. Growth strong and even ; all standing well. There was no smut, but leaves and stems were slightly rusted.

FIELD CROPS OF PEASE.

A number of varieties of this legume were sown, but immediately after cutting, and before ready to store, a very strong wind storm arose, which mixed the varieties so much as to render it impossible to distinguish one kind from another. The following is, therefore, a general report upon the field :

Pease.—$15\frac{1}{2}$ acres. Soil, part sandy loam of rather poor quality, and part peaty. Six acres of the land manured in the autumn of 1898 with about 12 tons of barn-yard

manure per acre: balance of field manured in the spring of 1897 with about 12 tons of barn-yard manure per acre. It was all ploughed in the autumn of 1898 about 8 inches deep, and the following spring it was disc harrowed once, and harrowed twice with the smoothing harrow before sowing. The previous crop was part hay; balance, oats. Sown, May 10, 2½ bushels per acre; came up May 23, and was ripe August 15. The time to mature was 96 days. Yield per acre, 18 bushels 32 pounds: weight per bushel 62¼ pounds. This field suffered from water several times during the summer, the yield per acre being for this reason considerably less than would have been the case under better conditions.

ENSILAGE CORN.

About 17 acres was under corn for ensilage. The following three varieties were sown adjoining each other on similar soil, and received similar treatment. The soil was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was clover. The land was ploughed late in the autumn of 1898, when a good swarth of second growth clover was ploughed under. The land received an application of barn-yard manure of about 15 tons per acre, which was distributed on the frozen ground in small piles of about one-third of a cart-load each, and spread in the spring. It was then ploughed under about 4 inches deep and harrowed with the smoothing harrow before sowing.

Longfellow.—7 acres. Sown, May 25, in rows 35 inches apart: came up, June 7, and was cut for ensilage September 13. Growth, medium to weak, on account of water, leafy from top to bottom, and 5 to 8 feet high; the stalks were poorly eared; ears beginning to glaze. Yield per acre, 10 tons 75 pounds.

Angel of Midnight.—2 acres. Sown, May 25, came up June 7, and was cut for ensilage September 15. Growth, uneven, weak, on account of wet weather; leafy from top to bottom, and from 4 to 7½ feet high; stalks were poorly eared; ears in dough state. Yield per acre, 8 tons 12½ pounds.

Compton's Early.—2 acres. Sown, May 25; came up, June 7, and was cut for ensilage September 15. Growth, uneven, weak; leafy from top to bottom; height, 4 to 7⅓ feet; stalks, fairly well eared; ears in dough state. Yield 11 tons 1,555 pounds per acre.

Selected Leaming.—2 acres. Soil part sandy loam and part peaty. The previous crop was oats. The land received an application of barn-yard manure of about 15 tons per acre, which was distributed on the frozen ground in small piles of about ⅓ of a cart load each, and spread in the spring. It was then ploughed under about 4 inches deep, and harrowed twice with the smoothing harrow before sowing. Sown, May 25; came up, June 7, and was cut for ensilage September 16. Growth, strong and even; leafy at top and very few leaves at bottom; height, 8 to 11 feet; stalks eared well; ears in late milk or early dough. Yield per acre, 11 tons 1,340 pounds.

Cloud's Early Yellow.—⅓ acre. This and the next five plots referred to were adjacent to the Selected Leaming; the soil was very similar, and so were the preparation and treatment of the land. Sown, May 25; came up, June 7, and was cut for ensilage September 16. Growth, medium, leafy at top, fewer leaves at bottom; height, 8 to 10 feet; stalks, well eared; ears in dough state. Yield, 9 tons 1,619 pounds per acre.

Giant Prolific Ensilage Sweet.—½ acre. Sown, May 25; came up, June 7, and was cut for ensilage September 18. Growth, strong, even, leafy at top with very few leaves at bottom; height, 10 to 11 feet, ears fairly plentiful in late milk stage. Yield, 11 tons 190 pounds per acre.

White Cap Yellow Dent.—½ acre. Sown, May 28; came up, June 7, and was cut for ensilage September 18. Growth uneven on account of water. Leafy top to bottom; height, 9 to 11 feet; stalks fairly well eared; ears in late milk. Yield, 13 tons 30 pounds per acre.

Mammoth Cuban.—½ acre. Sown, May 35; came up, June 7, and was cut for ensilage September 18. Growth strong and even, leafy on top, fairly leafy on bottom; height, 10 to 12 feet; stalks well eared, ears in late milk. Yield per acre, 13 tons 1,880 pounds.

Early Mastodon.—½ acre. Sown, May 25; came up, June 7, and was cut for ensilage September 18. Growth strong and even; leafy on top, fairly leafy on bottom; height, 10 to 12 feet; stalks well eared, ears in dough stage. Yield per acre, 14 tons 110 pounds.

Eureka.—½ acre. This and the two following plots were adjoining each other. The soil was similar and so were the preparation and treatment of the land throughout. Soil sandy loam, good quality. The land was manured in 1896 about 12 tons per acre.

Eureka: Sown, May 26; came up June 1, and was cut for ensilage September 19. Growth, strong, leafy on top, almost clean at bottom; no ears; height, 10 to 11 feet. Yield per acre, 14 tons 1730 pounds.

Iowa Silver Mine.—½ acre. Sown, May 26; came up, June 1, cut for ensilage September 19. Growth, strong, leafy on top, very few at bottom, no ears; height 10 to 11 feet. Yield per acre, 13 tons 820 pounds.

Iowa Gold Mine.—½ acre. Sown, May 26; came up June and was cut for ensilage September 19. Growth strong and even, leafy on top, very few at bottom; height, 10 to 12 feet, no cobs or ears. Yield per acre, 14 tons 1380 pounds.

FIELD PLOTS OF MANGELS.

The following seven plots were all sown in the same field adjoining each other, on similar soil and with similar treatment. The soil was a sandy loam of fair quality, and the previous crop was roots. The land was ploughed in the autumn of 1898, about 8 inches deep, and in the spring of 1899 it was grubbed about 6 inches deep, and harrowed with the smoothing harrow. The land was then made up in drills 2 feet apart and subsequently rolled with a heavy land roller which flattened the ridges nearly one-half, leaving a firm seed bed. The seed was then sown at the rate of 3 pounds per acre. All sown May 8, came up May 17; pulled, October 17.

	Yield per acre. Tons.	Lbs.	Yield per acre. Bush.	Lbs.
Gate Post 2 acres	11	1,950	399	10
½ a. Mammoth long Red (Vil)	10	490	341	30
½ a. Giant Yellow Intermediate (Vil)	8	170	269	30
½ a. " S. B. & Co.	7	400	240	—
½ a. Giant Yellow Globe (wet low land)	9	1,160	319	20
½ a. Gate Post Duplicate	5	1,570	192	50
1 a. Mammoth Long Red (Graham)	9	820	313	40

FIELD PLOTS OF CARROTS.

Three varieties were sown adjoining the mangels, the soil was similar and the preparation and treatment of the land the same, all sown 3 pounds seed per acre. Sown May 9 came up May 20, pulled October 24.

	Yield per acre. Tons.	Lbs.	Yield per acre. Bush.	Lbs.
1 acre Carrots Improved Short White	14	65	467	45
½ " Mammoth White Intermediate	14	1,950	499	10
½ " Giant White Vosges	14	510	475	10

FIELD PLOTS OF TURNIPS.

Three following varieties were sown adjoining the mangels. The soil was similar and the preparation and treatment of the land the same, all sown 2 pounds per acre. Sown June 7 came up June 13, and were pulled November 6.

	Yield per acre. Tons.	Lbs.	Yield per acre. Bush.	Lbs.
$\frac{1}{2}$ acre Perfection Swede	8	1,220	287	—
$\frac{1}{2}$ " Hardy Goliath	8	140	269	—
$\frac{3}{8}$ " Improved Bronze top	10	448	340	48

Purple Top Swede.—Soil a sandy loam of fair quality. This land received a dressing of about 12 tons of barn-yard manure per acre, distributed fresh from the barn-yard in small piles of about one-third of a cart load each during the winter, was spread in the spring, and ploughed under in spring of 1899 about 4 inches deep, and harrowed twice with the smoothing harrow. The land was then made up in drills two feet apart and subsequently rolled with a heavy land roller which flattened the drills nearly one-half, leaving a firm seed bed. The seed was sown at the rate of 2 pounds per acre. Sown, June 7; came up June 13, pulled November 6.

	Yield per acre. Tons.	Lbs.	Yield per acre. Bush.	Lbs.
1 acre Purple Top Swede (Steele)	18	275	604	35
1 " Hartley's Bronze	17	565	576	5
$\frac{3}{4}$ Prize Purple Top Swede	16	1,963	566	3

FIELD CROPS OF POTATOES.

The following table gives particulars of the results obtained from fifteen plots which were all grown adjoining each other in the same field. The land was similar throughout, and the preparation and treatment was the same for all. The soil was a light sandy loam, and the previous crop was barley. This land received an application of fresh barn-yard manure of about 12 tons per acre in spring of 1899, it was ploughed under 4 to 5 inches deep, harrowed with the smoothing harrow. The land was then made up in drills $2\frac{1}{2}$ feet apart, and 6 inches deep for planting.

Name of Variety.	Size of Plot.	When Planted.	Came up.	When dug.	Yield per Acre.	
	acre.				Bush.	lbs.
Wonder of the World	$\frac{3}{4}$	May 25	June 12	Oct. 2	134	12
American Wonder	$\frac{1}{2}$	" 25	" 12	" 2	177	20
Daisy	$\frac{1}{2}$	" 25	" 12	" 3	241	6
Dakota Red	$\frac{1}{3}$	" 25	" 13	" 3	265	36
Early Rose	$\frac{1}{3}$	" 25	" 12	" 3	186	43
Early Sunrise	$\frac{1}{3}$	" 25	" 12	" 4	227	3
Lee's Favorite	$\frac{1}{3}$	" 25	" 12	" 4	210	27
Clarke's No. 1	$\frac{1}{3}$	" 25	" 12	" 4	188	30
Empire State	$\frac{1}{4}$	" 25	" 12	" 4	229	12
Carman's No. 1	$\frac{1}{3}$	" 25	" 12	" 4	236	15
Everett	$\frac{1}{3}$	" 25	" 12	" 4	129	15
Rochester's Rose	$\frac{1}{3}$	" 25	" 12	" 5	182	39
Henderson's Late Puritan	$\frac{1}{6}$	" 25	" 12	" 5	177	12
Vanier	$\frac{1}{6}$	" 25	" 12	" 5	231	30
Early Harvest	$\frac{1}{4}$	" 25	" 12	" 5	135	31

SORGHUM.

The value of sorghum as a fodder crop is in some sections very great. It needs a rather dry warm spring, however, and is, therefore an uncertain crop in this latitude. The cultivation required is quite similar to that demanded by corn.

Two varieties were sown this year, Early Amber and Early Orange.

One-half acre Early Amber was sown 8 pounds to the acre, June 1. A period of cold wet weather followed and for six weeks it made very little progress. In August the dry hot weather suited it well and it made great growth. It was fed green to swine and was eaten with great relish by these animals.

One half acre Early Orange was sown 8 pounds to the acre, May 25. It failed to germinate, however, and had to be sown over again on June 12. This variety was thus even more backward than the Early Amber. It was fed green to swine.

RAPE.

The value of this plant as a soiling crop can scarcely be overestimated. It is very little cultivated by our farmers, however, too many of whom appear to know nothing of its great value.

It yields a large crop of very succulent and nutritious forage valuable as pasturage for sheep or swine and may be fed to cattle with good results. The method of cultivation is similar to that required for turnips, save that the plants do not need to be thinned in the row.

It will yield two crops in the season of from 3 to 6 tons per acre each if cut, and if pastured will stand very heavy stocking. Dwarf Essex is the variety best suited for common use and should be sown at the rate of about 3 pounds per acre.

It may be sown broadcast as well as in drills, when almost equally good results are obtained but if the soil is weedy it will be found advantageous to sow in drills. The soil for this crop needs to be well manured.

The date of sowing may be varied and a good crop may be anticipated from seed sown any where from May 10, to Aug. 15. It is thus possible to grow a crop of rape upon a grain field after harvest in the same year.

About $1\frac{1}{4}$ acres was sown to rape alone the past season, most of this was fed to swine, some of it to sheep, and pigs were pastured upon a small lot with very good results. On an acre of land sown to oats about 5 pounds of rape seed was drilled in from the grass seed box of the seeder at the same time as the oats were sown (May 4.) This lot did not succeed very well and appeared to have been sown too thinly. It yielded between 2 and 3 tons per acre in September.

REPORT OF THE HORTICULTURIST.

(W. T. Macoun.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit, herewith, for your approval, the thirteenth annual report of this division. Owing to the large number of branches of horticultural work included in this division, it is not possible in the annual report to give in detail all the experiments conducted and the results obtained during the year, but the matter contained in the following pages is that which was thought to be of greatest value and interest to farmers and fruit growers throughout Canada.

CHARACTER OF SEASON.

The winter of 1898-9 was one of the most disastrous in the history of fruit growing in southern and south-western Ontario; thousands of peach trees were root-killed, and other fruits suffered badly, the results being that the bright prospects of many a fruit grower were dashed to the ground. In northern and eastern Ontario this was not the case, what winter-killing there was being about normal. Very little snow fell at Ottawa during the early part of last winter, and it was feared at one time that winter-killing would be severe, but during the month of March more than 44 inches of snow fell. This came at a very opportune time, preventing the thawing and freezing of the ground, which is liable to take place during March and early in April, and which often proves very harmful to fruits. It was not an early spring this year, though not a very late one. The frost was out of the ground enough to use the spade on April 18, which was six days later than last year. The weather was comparatively cool during April and May. Little rain fell during April and the early part of May, but from the latter part of that month until the end of July there was rain in plenty. In July, alone, 9·85 inches fell. It was not a warm summer and crops which require much heat did not do as well as usual. Beginning with August 1, there was little rain until September 11, but in the horticultural department the lawn grass was all that suffered very much. Copious rain fell during September, October and November. On September 23, a frost killed the tomatoes, cucumbers, melons, squash and other tender things, but on October 2 there was one much more severe, which froze the ground to a depth of about three-fourths of an inch. This frost killed the leaves on the grape vines, and injured the fruit very much. October and November were exceptionally mild months and outside work was continued up to December 2. Winter set in on December 4, eight days later than last year.

FRUIT CROP.

There was a light crop of apples this year, what fruit there was being of good quality, however. There were a few pears on some of the trees, but all were of inferior varieties. The crop of native plums was light also, though a few trees were well loaded. Cherries were a failure altogether. If the season had been favourable there would have been an excellent crop of grapes, but the weather was not hot enough at the time of ripening, the result being that many varieties failed to mature and a severe frost coming

on October 2 injured them badly. There were good crops of small fruits, strawberries doing especially well.

PROGRESS OF THE WORK.

The work in connection with this division has made satisfactory progress this year, and much useful information has been obtained and data accumulated, which will be published from time to time to help forward the interests of horticulture in this country.

In the orchards and small fruit plantations the trees and bushes have received careful attention. Records were kept of the hardiness, growth and yield of the different varieties, and descriptions taken of as many of them as possible. The trees were thoroughly sprayed, as usual, and experiments conducted with different mixtures and solutions. One experiment, which was made, in whitewashing trees to prevent the swelling of the buds, while yielding affirmative results in that respect, showed the value of whitewash in ridding trees of the oyster-shell bark-louse.

New strawberry and gooseberry plantations were made this year, in which about 350 varieties of strawberries and 124 varieties of gooseberries are being tested.

Tobacco was grown to a larger extent than usual, there being 1½ acres devoted to this crop. A curing house has been erected after the most modern plan, and with the latest system of ventilation, and good results should be had in curing tobacco in future.

The nurseries in connection with this division, which, hitherto, had been divided into two sections, some distance from each other, have been consolidated into one and a wire fence built around it, which encloses also the hot-beds.

Another large area in the Arboretum was seeded down to lawn grass, which has added very much to the appearance of the place, and will make it much easier to get about in the outlying parts.

A new permanent label of galvanized iron for trees, shrubs and plants has been adopted, which can be made cheaply and will be much more conspicuous than the smaller zinc labels hitherto used.

During the year a catalogue of the trees and shrubs growing in the Arboretum was published in conjunction with the Director, in which interesting notes are given of the species and varieties tested. The total number of species and varieties tried thus far being 3,071.

Several thousand young *Pyrus baccata* seedlings have been raised this year, which will be used for distribution to Manitoba and the North-west Territories, and for grafting and budding the hybrids, between this crab and the cultivated varieties of apples, originated by Dr. Wm. Saunders and Dr. C. E. Saunders.

The work of top-grafting the tenderer varieties of our best apples on hardy stocks has been an important feature of the work. It is hoped that some varieties that have not hitherto succeeded here will do so on these stocks.

During the past five years blossoming dates of fruits have been recorded by a large number of observers for this division. The records of the apples have been tabulated and a synopsis given in this report. It is important for the fruit grower to know the relative dates of blossoming of the different varieties, that he may plant those which bloom at the same time in close proximity. The information given in this report will help him to do this.

Through correspondence we have endeavored to render assistance to fruit growers throughout Canada. Many have expressed their appreciation of this part of the work.

MEETINGS ATTENDED AND PLACES VISITED.

It has been my privilege during the past year to attend a large number of meetings of farmers and fruit growers, and to visit some of the important Arboreta and Botanic Gardens in the United States. On January 31 and February 1, I attended the winter meeting of the Quebec Pomological Society at Montreal, and on February 21 and 22, the annual meeting of the Nova Scotia Fruit Growers' Association at Wolfville. A series

of farmers' meetings were arranged for on Prince Edward Island during the last week of February and the first week of March, during which time I addressed audiences at Rustico on February 27 ; Kensington and Summerside, on February 28 ; O'Leary and Alberton on March 1 ; St. Peters and Souris on March 2.; Charlottetown on March 3 ; Hunter River and Murray Harbour South on March 4, and Georgetown on March 6. At the invitation of the Secretary of the Ontario Fruit Growers' Association, I addressed meetings of Horticultural Societies at Brockville on March 15 ; Cardinal on March 16 ; Iroquois on March 17 ; Smith's Falls on March 21 ; Carleton Place on March 23 ; Arnprior on March 24, and Kemptville on March 28. The biennial meeting of the American Pomological Society was held at Philadelphia on September 7 and 8, at which I had the pleasure of attending. It was also my privilege to attend and to give an address at the annual meeting of the Ontario Fruit Growers' Association, which was held at Whitby on December 5 and 6. The last meeting attended was that of the Ontario Agricultural and Experimental Union, at Guelph, Ont., on December 7.

During the month of September I visited, under your instruction, the New York Botanic Garden at Bronx Park, New York, and the Arnold Arboretum, Boston, Mass., at which places much information was obtained which will be useful in our work at Ottawa. On December 8 and 9, I visited St. Catharines and Niagara and arranged for experiments in whitewashing trees to determine whether lime would destroy the San José Scale or not.

ACKNOWLEDGMENTS.

I have been greatly assisted in my work during the past year by many who have paid especial attention to certain branches of horticulture and who are authorities in their work. There are others also who have kindly furnished information on various subjects whenever asked, and who, by their willingness to assist me in matters pertaining to horticulture, have made it much easier to obtain a knowledge of some things than it otherwise would have been. To those who, for the past five years, have regularly recorded the blossoming dates of fruits for this Division I am very grateful, and fully appreciate the trouble they have taken from year to year. Their names are recorded in another part of this report. Among those who have rendered me special assistance I desire to mention Mr. W. H. Dempsey, Trenton, Ont., Prof. F. A. Waugh, Burlington, Vt., U. S., Mr. Wm. A. Taylor, Washington, D.C., U.S., Mr. R. Hamilton, Grenville, Que., Mr. G. E. Fisher, Freeman, Ont., Mr. Robert Brodie, St. Henri de Montreal.

During the year my secretary, Mr. J. F. Watson, has again shown his knowledge of the details of this Division by the accuracy he has displayed in the correspondence and in other matters relating to his work. Mr. H. Holz, foreman, has also performed his duties in a thoroughly satisfactory manner, and his assistance has been of great value to me.

DONATIONS.

The following donations were received during the year, and this opportunity is taken to gratefully acknowledge the same :—

Sender.	Donation.
Aylmer Iron Works, Aylmer, Ont	Spray pump No. 2, barrel pump.
Anderson, Wm., Woodstock, Ont	Apple scions.
Anderson, J. C., Fallbrook, Ont	Scions, Lanark Greening, Iroquois apples.
Arnold Arboretum, Boston, Mass., U.S	Collection of seeds.
Barr, Peter, London, Eng	57 species and varieties of pæonies.
Brown, C. E., Yarmouth, N.S	Scions of double-flowering hawthorn.
Craig, Wm., Maritana, Que	Scions, Guerin apple and plum trees.
Cairncross, G., London Junction, Ont	3 varieties rhubarb.
Dempsey, W. H., Trenton, Ont	Apple scions.
Foster, Mrs. S., Knowlton, Que	Scions, Hardy and Edgehill apples.
Freemantle, Henry, Coalfields, Assa	6 cuttings Freemantle Redpath Ruby Red Currant.
Hay, G. U., St. John, N.B	Specimens of American arbor vitæ and *Ilex verticillata.*
Hamilton, Robert, Grenville, Que	Apple scions.
Iowa Experiment Station, Ames, Ia., U.S	Apple scions.
Johnston, Asa. A., Cowansville, Que	Scions, Kinkead, No. 2, No. 3, No. 7, apples.
Johnstone, John, Long River, P.E.I	Sample McIntyre Potato.
Kettle, Stephen, Ursa, Ont	Seeds of gorse, broom and holly.
Lalonde, Antoine, Isle Verret, Que	Tobacco seed.
Lagace, Jules, Madawaski, Que	Scions, seedling apple.
Leef, W. H., Orillia, Ont	Scions of seedling plum.
Marsh, J. D., Mille Roches, Ont	Scions, No. 2, seedling apple.
Morris, Stone & Wellington, Welland, Ont	Apple scions.
Mallory, N.E., Guilds, Ont	25 plants Edgar strawberry.
New York Botanic Gardens, Bronx Park, N.Y	44 species perennials.
Ontario Agricultural College, Guelph, Ont	Collection of 13 varieties of strawberries, 6 varieties of raspberries.
Robson, T. A., Minden, Ont	Apple scions.
Royal Gardens, Kew, London, Eng	Collection of seeds.
Smith, E. D., Winona, Ont	1 tree Emerald plum.
Sivers, Max von, Roemershof, Russia	Seeds and plants.
Simpson, W., P.E.I	Clover roots.
Smallwood, A., Middleton, P.E.I	Plants of *Achillea Ptarmica.*
Sole, Thos., Sarnia, Ont	Scions of unknown apple.
Spramotor, Co	London, Ont., Spray pump.
Starr, R. W., Wolfville, N.S	Hardy roses, native spiræas, plum tree, Scions of Gravenstein and Red Gravenstein apples.
Trotter, Miss L. A., Owen Sound, Ont	Scions, seedling pear.
Tolmie, J., Victoria, B.C	Perennials.
Thonger, Prof. C. G. Freer, F.R.S., Colonial College, Hollesley Bay, Suffolk, Eng	Apple scions, Collection of 24 varieties.
Woodward, J. S., Lockport, N.Y., U.S	Scions, Milwaukee apple.
Wilson, Fred, Stouffville, Ont	Plum scions.

I have the honour to be, sir,

Your obedient servant,

W. T. MACOUN,

Horticulturist.

APPLES.

Most of the apple trees came through the winter of 1898-9 in good condition. The trees suffered most on a sandy hill, on which the snow did not lie very well and where even the cover crop failed to afford the required protection. Several of the trees were root killed and a few others had their roots injured considerably. The number of trees which died or were destroyed by storms during the year was fifty-five. Most of the trees made good growth during the past season, notwithstanding the fact that many of them are affected with what is known as "black heart." The gaps caused by the heavy losses from winter-killing during the winter of 1895-6 are fast being filled up by the young trees which were planted since that time, and the apple orchard, on the whole, looked well. The crop of apples was light this year; there were, however, 175 varieties which fruited, although only a few of the trees were well loaded. Insects were not very troublesome, although if the tent caterpillars had not been taken in time they would have caused much injury. The trees were given two sprayings to destroy the oyster shell bark-louse, which was first found running on May 29. The trees were sprayed on June 1, with tobacco water and whale oil soap, made by using 10 pounds tobacco and 2 pounds whale oil soap to 40 gallons of water. On June 6, the trees were sprayed a second time with whale oil soap at the rate of 8 pounds to 40 gallons of water. This destroyed many of the insects.

The regular sprayings were made with sulphate of copper and Bordeaux mixture; once with sulphate of copper and four times with Bordeaux mixture. There was practically no scab on the fruit this season, and the codling moth did not affect it so much as last year. The dry rot, of which mention is made elsewhere, affected a number of varieties but did not appear any worse than last year.

DESCRIPTION OF VARIETIES.

A few varieties of apples not hitherto described in the reports of the horticulturist are worthy of special mention this year.

Shiawassee Beauty.—Medium size, oblate or flat, regular; skin yellow, washed over nearly the whole surface with deep red; dots few, pale, distinct, but not prominent; cavity, medium depth, open; stem, medium length, slender; basin, medium depth and width, smooth; calyx partly open. Flesh white, crisp, very tender, juicy, mild subacid, pleasant flavour, core small; skin thick and tough. Quality very good. Season, November, December. Tree a medium, spreading grower, fruiting heavily every other year. Originated in Michigan.

Milwaukee—Large, oblate; skin pale yellow, well splashed and washed with bright red and crimson; dots moderately numerous, small, white, distinct; cavity, deep, medium width, slightly russetted; stem short, slender; basin deep, open, slightly wrinkled; calyx, large, open. Flesh yellowish, crisp, tender, melting, juicy, acid; core medium size; skin moderately thick and moderately tough. Quality above medium, almost good. Season December to February. A handsome apple, excellent for cooking. A tree planted in 1895 bore heavily this year. It is a seedling of Duchess originating with Mr. Geo. Jeffery, Milwaukee, Wisconsin.

Walter—Very large, roundish, rather irregularly ribbed; skin pale yellowish green streaked and splashed with red, heavier on sunny side; dots few, small, white, distinct; cavity deep, medium width; stem short; moderately stout; basin deep and medium width; calyx closed. Flesh yellow, tender, melting, juicy, brisk subacid; core small, skin moderately thick, fairly tender. Quality above medium, almost good. Season October. Tree an upright moderate grower, bearing heavily every other year. Originated by the late P. C. Dempsey, Trenton, Ont. A cross between Northern Spy and Golden Russet, the former being the female parent. The original tree fruited for the first time in 1891. A very handsome apple.

Lawver (Delaware Red Winter).—Above medium size, roundish, broadly ribbed. Skin yellow, nearly all or all, washed with bright red; dots few, pale, distinct; cavity medium in depth, narrow; stem long, slender; basin very shallow, narrow, wrinkled; calyx closed. Flesh yellow, sometimes faintly tinged with pink, tender, crisp, juicy, sprightly subacid, aromatic; core small; skin thick and tough. Quality above medium. Season, January to June, but will keep for more than a year. An annual, but a shy bearer at the Experimental Farm. Tree a medium, spreading grower. In 1898 there was so marked a difference between the fruit of the Lawver and the apple we have under the name of Delaware Red Winter, that they were thought to be quite distinct, but this year no difference can be detected. The description made of the Delaware Red Winter last year differed from the one given above in these particulars:—Brighter in colour than Lawver; cavity a little broader, basin deeper, calyx larger; flesh not tender as in Lawver; sub-acid, not sprightly; skin tenderer than Lawver. Why this difference should have occurred is still a mystery. The difference was not confined to a few specimens, all being the same. The fruit was picked about the same time. Others who saw the two apples in 1898 thought them distinct varieties. We are now quite confident that Delaware Red Winter is a synonym of Lawver.

RUSSIAN APPLES.

There were not so many of the Russian varieties of apples fruited this year as last, but those that did were carefully compared in order to continue the work of eliminating synonyms; descriptions were made of most of the kinds which ripened, and notes taken on the growth of the trees. Each year adds convincing proof of how little value most of these varieties are in all but the extreme limits of successful apple culture. While a large number of the trees are suffering from 'black heart,' which has affected them for several years, many of those which were badly affected with blight in 1893, and were severly pruned in consequence, are regaining symmetrical proportions. Last winter and during the past summer 23 trees died or were blown down; all of which were rotten at the root.

The following are the varieties which have this year been found fruiting under different names, or found to be different varieties under the same name. As we are not yet sure of the proper names for these varieties, it is impossible to say which are the synonyms:—

Green Sweet. Lebonkey Sweet. Described, August 8. Fruit large, roundish, sometimes oblate; skin pale yellow, a considerable number of pale yellow dots; cavity medium in depth, narrow, stem short, stout; basin medium depth and width, considerably wrinkled. Flesh white, firm, moderately juicy, acid, astringent; core small, skin moderately thick, tender. Poor quality. Not promising.

Herrin. Osimoe 7 M., 57 M., Good Peasant, Beautiful Arcade. Described August 19. Fruit large, roundish, pale-green, with a purplish pink blush on sunny side, dots few, white, obscure; cavity medium in depth, narrow, stem short, moderately stout; basin medium depth and width, slightly to considerably wrinkled, calyx open. Flesh white, juicy, sweet, fair flavour, core small, skin thick and tough. Medium quality. A pleasant flavoured sweet apple.

Antonovka. Cinnamon, German Calville, Yellow Arcade. Described October 5. Fruit large, irregular, oblong, roundish or slightly conical, ribbed; skin yellow, a few pale-green obscure dots which, being raised, make the skin rough to the touch; cavity deep, moderately open, russetted; stem short, stout; basin deep, narrow, slightly wrinkled; calyx closed. Flesh yellow, firm, moderately juicy, tender, brisk sub-acid, with a peculiar, pleasant, spicy flavour; core small; skin thick, tender. Quality, almost good. Season, October. Better than most of the Russian varieties.

Bogdanoff. Repka Winter, Tested December 14. Fruit above medium size, oblate, ribbed though not prominently; skin yellowish-green, well streaked and splashed with purplish red; dots few, obscure; cavity deep, of medium width, russetted; stem short, moderately stout; basin deep, medium width, slightly wrinkled; calyx open; flesh white, crisp, moderately juicy, mild sub-acid; core, small; skin, thick, rather tough. Medium quality. Season, December, January.

Grandmother. Bogdanoff, Bogdanoff Steklianka, Red Reinette. Described November 28. Fruit large, conical; skin greenish-yellow with a pink blush on sunny side; dots few, gray, not prominent; cavity deep, narrow, much russetted; stem short, moderately stout; basin medium depth and width, slightly wrinkled; calyx large, open; flesh yellow, crisp, tender, moderately juicy, pleasant flavour, brisk sub-acid; core, medium size; skin, thick, moderately tender. Good quality. Season, November. One of the best of the Russian varieties.

Three varieties have been found under the name of Melonen. First, that described as a synonym of Liveland Raspberry in the report for 1898, and two others, quite distinct.

RUSSIAN APPLE SEEDLINGS.

It was reported last year that 1,016 of the Russian apple seedlings were still living. This year 118 of the poorest shaped and least vigorous trees were removed to give more space to those remaining. A number of those which have fruited and have been found to be of little value will be cut out before spring. The number now remaining is 898.

It is surprising how vigorous and healthy the seedlings are, growing in apparently almost pure sand and not receiving any fertilizers; but the fruit which is produced on them partakes of most of the characteristics of the named Russian varieties, and although 133 have fruited during the past three years, 43 of which fruited this year, none of them are of sufficient merit to deserve special mention. A large proportion of them, however, seem just as good as most of the named Russian sorts which have been disseminated in this country. No late-keeping winter apples have yet been found among them.

TOP-GRAFTING.

Many of the best varieties of apples do not succeed at Ottawa; they are either subject to sun-scald, root-killing, or killing of the terminal branches. There are, however, other kinds of apples, possessing less commercial value, which are quite hardy and do not suffer from sun-scald. In 1896, four of these varieties, McMahan White, Gideon, Haas and Romna, were planted as stocks on which to top-graft some of the tenderer sorts, it being thought that some of them, at least, would succeed at Ottawa if grown in this manner. Top-grafting was begun on these stocks in the spring of 1898, and continued this year; the following varieties being successfully grafted:—Baldwin, Belle de Boskoop, Benoni, Dominie, Early Harvest, Esopus Spitzenburg, Fallawater, Keswick Codlin, King of Tompkins Co., Mother, Newtown Pippin, Northern Spy, Ontario, Rhode Island Greening, Rome Beauty, Sutton Beauty, Wagener, Winesap and York Imperial.

This work will be continued until all the best varieties of apples which are likely to grow here have been tested. The results of this work will be watched with much interest from year to year. To show the possibilities in this direction, it may be said that in 1891 a tree of Duchess and two trees of Wealthy were top-grafted with Northern Spy, which will not live on its own roots at Ottawa. All of these fruited in 1897. The grafts on Duchess produced fruit in 1897 and 1899, and those on Wealthy in 1897 and 1898. The wood of the Northern Spy appears quite hardy, and if the Duchess and Wealthy had been stronger growing stocks it is probable that good crops would have been produced for many years, but the Northern Spy is out-growing the stocks and soon the trees will be so top heavy that they will likely break off in a severe storm. It is, then, not wise to top-graft a strong-growing variety on a weak-growing stock.

There are so many apple trees of little value growing in Canada, which could be successfully top-grafted with better varieties, that it would well repay any one possessing an orchard to go carefully over his trees and top-graft those which do not produce paying crops. A circular on top-grafting was published by the Experimental Farm a few years ago which can be had on application, in which the methods employed in top-grafting are clearly set forth. The chief points to take into consideration in top-grafting may be briefly summarized from the circular, thus :—

1. Old trees, if healthy, may be grafted with success.

2. The top should not be all cut away the first year, but should be removed gradually, the time required to change the top of a large tree successfully being from three to five years.

3. Early spring, before growth begins, is the best time to graft.

4. The branches to be grafted should not be more than from 2 to 3 inches in diameter where the grafts are to be inserted.

5. After the branch is carefully sawn in two, the stub is split with a mallet, held open with a wedge, and the scions inserted ; two being used, one on each side, if the branch is more than an inch in diameter.

6. The scion is made from a twig of the previous year's growth, about 4 or 5 inches long and having three or four buds. It is prepared by making a wedge of the lower end, beginning near the base of a bud. The scion is inserted in the stock as far as the upper edge of the wedge.

7. In inserting the scion, great care should be taken that the inner bark of both scion and stock should come in contact with each other. This is very important, as the healing begins from this point and if the scion is inserted carelessly there is almost certain to be a failure.

8. After the scion has been set, the cut surface is covered over with grafting wax to exclude air, and strips of cotton may be wrapped over this.

9. A good grafting wax for outdoor use is made by melting together resin and beeswax in the proportion of five parts resin and two parts beeswax ; to this is added one and one-half to two parts linseed oil.

10. In top-grafting a tree, always have in view the production of a symmetrical top after the old one has been removed.

PEARS.

The pear trees were very little injured last winter, and during the past summer they made good growth. A few varieties fruited, but none of these were of special merit, being, most of them, inferior sorts of Russian origin. No blight appeared in the orchard. The Russian pears have proved the hardiest at the Experimental Farm, and advantage has been taken of this fact to top-graft them with some varieties of better quality. This work was begun last spring, and the following kinds were successfully grafted :—

Angouleme, Bartlett, Clairgeau, Clapp's Favourite, Gansel's Bergamot, Dr. Jules Guyot, Duhamel du Monceau, Emile d'Heyst, Madame Treyve, Knight's Monarch, Pitmaston Duchess, St. Swithin, Seckel, Smith's Hybrid, and Vicar of Winkfield. As there are no pears of first class quality which are hardy at Ottawa on ordinary pear stocks, it is hoped that by top-grafting them on Russian stocks a few may succeed here, but as the Russian pears sometimes kill out here, they are also liable to be lost at any time. It is proposed this winter and next summer to use European mountain ash and a wild pear from China called *Pyrus betulaefolia* as stocks, as these are hardy at Ottawa, and tender varieties grafted or budded on them may succeed. Any plan that will be likely to cause the best pears to fruit at Ottawa will be tried, in the hope that sometime success will crown our efforts.

PLUMS.

It is only a few years since nearly all the trees in the plum orchard were winter-killed, but the dead trees have all been replaced and the orchard now looks well.

Very few trees were injured last winter, and most of them made strong growth during the past summer. There was only a light crop of fruit, but forty varieties bore this year. These were, however, nearly all American sorts. The aphides were not troublesome this year, but the shot-hole fungus riddled the leaves very badly, notwithstanding the thorough sprayings which the trees received. It is supposed by some that spraying increases the disease, but it was bad on trees that were not sprayed.

Of the varieties of American plums which fruited this year, the following, given in their order of ripening, were the most promising:—

Bixby, ripe Aug. 31; Cheney, ripe Sept. 2; New Ulm, ripe Sept. 6; Ocheeda, Wolf, City, Cottrell, ripe Sept. 14; Stoddard, Wyant, ripe Sept. 19; Comfort, DeSoto, ripe Sept. 25.

The Aitkin plum, which ripened on August 22, is a fine large red plum, but is only of medium quality. It may be planted with advantage on account of its earliness.

CHERRIES.

A few more of the old trees died this year, and there are now not many of them left. The trees of the Koslov Morello cherries were not as vigorous as usual, and had evidently been injured more or less last winter. All the young trees available in the nursery were utilized this year to fill up the blanks which still remained after the destructive winter of 1895–96. There were 133 trees planted, comprising twenty-one varieties. Nearly all of these are grafted or budded on bird cherry (*Prunus pennsylvanica*) stock. There was practically no fruit this year.

GRAPES.

This was a very unfavourable season for grapes. A wet July seemed to favour the growth of Anthracnose and many varieties were more or less affected by it. The whole summer was unfavourable to the rapid maturing of the fruit, and September was particularly so, being cold, cloudy and wet. A frost which occurred on September 23 did considerable damage, while another much more severe on October 2 killed the leaves on the vines and ruined a large quantity of fruit which was not sufficiently mature to harvest. While 130 varieties ripened in 1898, only sixty were fully matured this year. It was very interesting to note the date of ripening of the different sorts this year, as some which matured early last season did not ripen this year until late, thus showing which varieties would ripen early, even though the season were unfavourable, and those which require a greater amount of heat. In the report for 1898, a list was given of twenty-five of the earliest varieties for that year, in the order of their ripening. The following list of the twenty-five earliest this year will be interesting for comparison:—

Twenty-five earliest ripening varieties of Grapes 1899:

Florence, Sept. 7; Champion, Golden Drop, Sept. 17; Moore's Early, Sept. 21; Brant, Sept. 22; Moyer, Peabody, Canada, Pattison, Janesville, Telegraph, Sept. 23; Eumelan, Sept. 25; Belvidere, Hartford, Sept. 26; Early Victor, Cottage, Rogers No. 5, Northern Muscadine, Sept. 27; Marion, Requa, Maxatawney, Dracut Amber, Rogers No. 24, Sept. 29; Clevener, Sept. 30; Potter, Oct. 2. Of these, Florence, Northern Muscadine, Maxatawney and Dracut Amber are not desirable.

The cover crop of clover which was in the vineyard last winter was ploughed under on May 15, and the soil kept cultivated throughout the early part of the season. A large amount of old wood was removed from the vines this autumn and where possible new arms were obtained. It will take several seasons to renew all the vines, as it is difficult to get the required amount of wood in the proper place, and many of the vines do not sucker readily. The vineyard received a dressing of wood ashes and kainit last spring, part of the vines receiving the former at 100 bushels per acre, and part of the latter at 1000 pounds per acre.

CURRANTS.

There was a good crop of currants this year and all the bushes grew well. Some of the newer varieties began to fruit and a few of them give promise of being valuable, but it is too soon yet to pass judgment upon them. Cuttings were taken of all the varieties this autumn, looking forward to the making of a new plantation in 1901.

In the following tables will be found the yields of the different varieties during the past season, and other notes regarding them.

CURRANTS—RED.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield.		Average Yield Per Bush.	
			1899.		Lbs.	Oz.	Lbs.	Oz.
Red Dutch	1893	July 6	Small to medium	6	73	15	12	5
Red Grape	1893	" 6	Above medium	6	64	15	10	13
Raby Castle	1893	" 6	Medium	6	62	7	10	6
Greenfield	1893	" 6	Medium to large	6	43	3	7	3
La Conde	1893	" 6	Medium	4	25	4	6	7
London Red	1893	" 6	Large	6	37	..	6	3
Early Scarlet	1893	" 4	Medium	6	29	11	4	15
Cumberland Red	1896	" 6	Large	3	12	8	4	3
Cherry	1893	" 6	Small to medium	6	24	8	4	1
Ribes striatum	1893	" 8	Small	6	24	4	4	1
North Star	1893	" 6	Medium to above medium	6	21	8	3	9
Victoria	1893	" 6	" "	6	17	3	2	14
Fay's Prolific	1893	" 6	Very large	6	15	13	2	10
Wilder	1893	" 6	Large	6	14	14	2	8
Prince Albert	1893	" 12	"	6	6	12	1	2
Simcoe King	1896	" 6	"	6	4	12	..	13
Versaillaise	1893	" 6	Very large	6	1	9	..	4
Fertile d'Angers	1893	" 6	"	6	1	3	..	3
Moore's Ruby	1893	" 6	Large	4	..	8½	..	2

WHITE.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield Lbs.	Yield Oz.	Average Lbs.	Average Oz.
Climax	1893	July 6	Large	6	21	14	3	10
White Dutch	1893	" 6	Medium	6	12	9	2	1
White Grape	1893	" 6	Large	6	8	13	1	7

BLACK.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield Lbs.	Yield Oz.	Average Lbs.	Average Oz.
Ontario	1893	July 6	Medium to large	6	55	6	9	4
Eagle	1893	" 8	Medium to above medium	6	51	5	8	9
Beauty	1893	" 7	Medium	6	45	5	7	9
Kerry	1893	" 6	Above medium to large	6	45	6	7	9
Climax	1893	" 10	" "	6	38	7	6	6
Success	1893	" 4	Large	6	35	3	5	14
Perry	1893	" 10	Small to medium	6	35	3	5	14
Clipper	1893	" 6	Medium to large	6	33	10	5	10
Black Champion	1893	" 16	Medium to above medium	6	33	13	5	10
Lee's Prolific	1893	" 8	Medium	6	31	..	5	3
Winona	1893	" 6	Above medium	6	29	13	4	15
Monarch	1893	" 7	Medium to large	6	28	..	4	11

CURRANTS—BLACK—*Concluded.*

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield.		Average Yield per Bush.	
			1899.		Lbs.	Ozs.	Lbs.	Ozs.
Orton	1893	July 6	Large	6	28	1		11
Ethel	1893	" 8	Medium to above medium	6	26	..	4	5
Stewart	1893	" 14	Small to medium	6	23	10	3	15
Beauty	1893	" 8	Medium to large	6	22	8	3	12
Eclipse	1893	" 6	Above medium to large	6	22	1	3	11
Victoria Black	1893	" 12	Very large	6	19	15	3	5
Charmer	1893	" 12	Small to medium	6	18	½	3	..
Black English	1893	" 10	Large	6	17	2	2	14
Prince of Wales	1893	" 16	Small to medium	6	14	13	2	7
Black Naples	1893	" 16	Medium to large	3	7	1½	2	6
Standard	1893	" 6	Large	6	13	6	2	4
Ogden	1893	" 7	Medium	6	12	3½	2	1
Dominion	1893	" 8	"	6	12	3	2	..
Stirling	1893	" 7	"	6	11	5	1	14
Star	1893	" 7	"	6	9	7	1	9
Mattie	1893	" 8	Medium to large	6	6	10	1	2
Perth	1893	" 7	"	6	4	13		13
Madoc	1893	" 4	Small to medium	6	3	15		10
Oxford	1893	" 6	Above medium	6	3	..		8
Lewis	1893	" 7	Medium	6	1	1		3

The following varieties have been planted within the last two years :—

CURRANTS—RED.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield Lbs.	Yield Ozs.	Average Lbs.	Average Ozs.
Knight's Large	1897	July 6	Large	6	1	12	..	5
Moore's Seedling	1898	" 9	Very large	6	..	13½	..	2
Goliath	1898	" 6	Medium	6	..	11½	..	2
La Fertile	1898	" 6	Large	6	..	3	..	½
Houghton Castle	1898	" 6	Medium	6	..	2	..	⅓
Benwell	1898			6	..	2	..	⅓
Victoria	1898			6	..	2	..	⅓
Defiance	1898			6	..	1½	..	¼
Wentworth Seedling	1898		Medium	6				
Comet	1899			6				
Pomona	1897			4				
Large Bunch Holland	1897			6				

WHITE.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield Lbs.	Yield Ozs.	Average Lbs.	Average Ozs.
White Imperial	1897	July 6	Large	6	8	12	1	7
Transparent	1898	" 6	Medium	6		6		1
Wentworth Leviathan	1898			6		1½		¼

BLACK.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Yield Lbs.	Yield Ozs.	Average Lbs.	Average Ozs.
Victoria Black	1898	July 12	Very large	6	6	5	1	1
Ismay's Prolific	1898	" 15	Medium to above medium	6	4	4		11
Black Grape	1898	" 10	Large	6	2	5½		6
Buddenborg's Black	1898	" 13	Very large	6	1	6½		4
Black Prince	1898	" 14	Large	6	1	½		3
Baldwin	1898	" 9	Above medium	6	1	2½		3
Collin's Prolific	1899			6				

RASPBERRIES.

It was reported last year that the raspberry plantation was not in a condition to make reliable comparisons of the different varieties being tested. It has improved somewhat in this respect this season, though there are still quite a number of varieties where the plants are not yet all in full bearing. As many as possible of the vacancies were filled this year, though the work is not yet complete. In a collection of so many varieties, it is very difficult to have them all in the right condition for accurate comparisons of yields. Most of the plants came through last winter well.

In 1895 a bulletin was published on raspberries, in which the results obtained with the different varieties up to that time were given, with information also as to the best methods of growing this fruit. This bulletin may be obtained on application by those who desire to know which are the best varieties to plant. Few good varieties have been introduced since that time. The Loudon raspberry, which is one of the best of the newer red varieties, will probably not prove superior to the Cuthbert. The Columbian, a purple variety, is very promising and may take the place of Shaffer's Colossal.

GOOSEBERRIES.

Only the American varieties of gooseberries have hitherto succeeded at the Experimental Farm. The European sorts are always so badly mildewed that what little fruit remains on the bushes is practically useless. In order to see if change of soil would have any effect on them, all the varieties, both American and European, were layered in 1898, the object being to start a new plantation on heavier and moister soil. Last spring the plants were set out. The American varieties which were layered had made good roots, but the European, as was expected, had in many cases only a few fibres. The old bushes, however, were divided where the layers were not sufficiently rooted, and a plantation was made consisting of twenty-nine American and ninety-five European varieties. The former made good growth, but the latter, though well sprayed, made very little; they will, however, be given a thorough test under these new conditions, and better results may be expected from some of them. Owing to the layering of so many of the bushes it is not possible to give yields of the different varieties. Downing, Pearl, and Red Jacket are still the leading American sorts, though some of Dr. Wm. Saunders' newer seedlings are very promising.

STRAWBERRIES.

This has been a very good season for strawberries in the Ottawa Valley, the crop being good and the prices high. It has given a great impetus to the growing of this fruit here, and a much increased acreage will be planted next spring.

A new strawberry plantation was made at the Farm this year, consisting of 350 varieties. Many of these will be discarded after one year's fruiting, as they have already been tested here, but we are not yet familiar with all of them, and it is desired that they may be studied and notes taken of them before they are no longer available. The soil used for this plantation is a good sandy loam which had been planted with potatoes in 1898 and ploughed shallow in the autumn of that year. In the spring of 1899 well rotted manure was applied at the rate of 30 tons per acre, the land was then ploughed just deep enough to cover the manure, and then disc harrowed twice, once lengthwise and once crosswise, in order to get the manure well incorporated with the soil. It was then rolled with a heavy land roller. The rows were marked off 3½ feet apart with a corn marker and twenty-four plants of each variety planted with a trowel, 15 inches apart in the rows, each variety occupying two rows of twelve plants each. No fruit was allowed to ripen this year, and no runners were permitted to grow until July. The soil was kept thoroughly cultivated and hoed throughout the season. Owing to about six weeks of dry weather during the month of August and the first half of September there were not as many runners formed as one would have liked, but there

are enough to promise a good crop of fruit next season. A light covering of straw was spread over the plants on December 16.

It is the intention to make a new plantation at least every two years hereafter. For commercial purposes it is the best practice to only take off one full crop and then plough the plants under.

As the old plantations had been bearing for several seasons, the varieties this year could not be fairly compared, and hence no table of yields is given.

Some of the best berries now on the market are Clyde, Glen Mary, Wm. Belt, Bubach, Greenville, Haverland, Lovett, Brandywine. The Sample, from all accounts, is a very promising new berry, but this has not fruited here yet.

A NORTHERN EXPERIMENTAL ORCHARD.

(SECOND REPORT.)

In the report of the Horticulturist for 1895, there was published, under the heading 'A Northern Orchard,' the results obtained by Mr. J. C. Chapais, St. Denis, Que., in testing large and small fruits at his place. As it is believed that the information given at that time has proven very useful to intending planters along the lower St. Lawrence, it has been thought wise to again publish a list of the trees tested by Mr. Chapais, as, after the last list appeared, many of the varieties, then doing well, succumbed to the severe winter of 1895-6, and it is important that fruit growers should know which were killed and which survived.

We are very grateful to Mr. Chapais for furnishing us with these notes, which, we know, will be appreciated by those whose climatic conditions are similar to his own.

Owner.—J. C. Chapais.

Locality.—St. Denis, County of Kamouraska, Province of Quebec, Canada.

Latitude.—47° 30′.

Lowest Temperature.—30° below zero Fahrenheit, experienced only twice in thirty six years.

Highest Temperature.—94° Fahrenheit.

Rainfall.—Average for twenty years, 29½ inches per year, including snow fall; 10 inches of snow estimated to equal 1 inch of rain. The average thickness of snow is 3 feet in open country.

Exposure.—Ground gently sloping to the north.

Soil.—Sandy clay, well drained.

Predominant Wind.—North-eastern damp wind, with salt emanations from the Gulf of St. Lawrence.

Reference Nos.	Varieties Planted.	When Planted.	Growth and Present Condition.	Blooming in 1899. First Flowers	Full Bloom.	Last Flowers
	Apples.					
1	Alexander	1891	Very good; fruiting	June 3	June 10	June 16
2	Antonovka	1889	Winter-killed, 1895-6			
3	Arabka (Ell. & B.)	1889	" "			
4	" Summer	1889	" "			
5	Ben Davis	1898	Very good			
6	Blushed Calville	1889	Winter-killed, 1895-6			
7	Bode	1892	Very good			
8	Canada Baldwin	1898	"			
9	Canada Red	1898	Good			
10	Charlottenthaler	1889	Winter-killed, 1895-6			
11	Duchess of Oldenburg	1889	Good; fruiting	June 6	June 10	June 16
12	English Golden Russet	1891	Very good; fruiting	May 31	" 5	" 11
13	Fameuse	1889	" "	June 3	" 5	" 12
14	General Grant	1897	" " winter-killed, 1895-6; re-planted, 1897	" 2	" 7	" 13
15	Gipsy Girl	1892	Winter-killed, 1895-6			
16	Golden White	1891	" "			
17	Grand Duke Constantine	1889	" "			
18	Grandmother	1889	Very good; fruiting	June 6	June 12	June 15
19	Grimes' Golden	1899	Good			
20	Hare Pipka	1892	" fruiting	June 4	June 11	June 14
21	Hyslop	1889	Bad "	" 3	" 8	" 13
22	Longfield	1898	Good; winter-killed, 1895-6; re-planted, 1898			
23	Louis' Favourite	1891	Winter-killed, 1895-6			
24	McIntosh Red	1891	Very good; fruiting	June 2	June 10	June 15
25	Mann	1898	Good			
26	Montreal Beauty	1898	"			
27	Ontario	1899	"			
28	Orel No. 1	1894	Very good; fruiting	June 7	June 13	June 18
29	Peach of Montreal	1891	" "	" 1	" 7	" 12
30	Pewaukee	1899	Good			
31	Princess Louise	1891	Very good; fruiting	June 6	June 11	June 16
32	Red Astrachan	1889	Good "	" 3	" 9	" 14
33	Red Beitigheimer	1898	Very good; winter-killed, 1895-6; re-planted			
34	Red King	1898	Very good			
35	Red Queen	1893	"			
36	Salome	1898	Good			
37	Saint Lawrence	1891	Very good; fruiting	June 2	June 7	June 14
38	Summer Strawberry	1891	" "	May 30	" 5	" 10
39	Titovka	1889	Good "	June 3	" 9	" 14
40	Transcendent	1889	Very good "	" 1	" 7	" 12
41	Wealthy	1889	Good "	May 28	" 6	" 11
42	Whitney	1891	Very good "	June 1	" 7	" 14
43	Winter Arabka	1898	"			
44	Winter St. Lawrence	1898	Good; winter-killed, 1895-6; re-planted			
45	Wismer Desert	1898	Very good			
46	Wolf River	1898	Good			
47	Yellow Transparent	1898	"			
	Plums.					
48	Blue Damson	1889	Very good; fruiting			
49	Blue Imperial	1897	"			
50	Bradshaw	1898	Bad; winter-killed, 1895-6; re-planted			
51	Canada Orleans	1898	Good			
52	Coe's Golden Drop	1898	Good; winter-killed, 1895-6; re-planted			
53	Early Yellow	1889	Very good; fruiting	June 2	June 6	June 11

Reference Nos.	Varieties Planted.	When Planted.	Growth and Present Condition.	Blooming in 1899. First Flowers	Full Bloom.	Last Flowers
	Plums—Concluded.					
54	Grand Duke	1899	Good			
55	Gueii	1898	"			
56	Home Seedling	1892	"			
57	Imperial Gage	1898	Good; winter-killed, 1895-6; re-planted			
58	John Trotter	1892	Good			
59	Lombard	1898	Good; winter-killed, 1895-6; re-planted			
60	Moore's Arctic	1898	Very good; winter-killed, 1895-6; re-planted			
61	Niagara	1899	Good			
62	Pond's Seedling	1898	"			
63	Reine Claude de Bavay	1898	"			
64	Reine Claude de Montmorency	1889	Very good; fruiting	May 30	June 5	June 12
65	Saunders	1898	Good			
66	Shropshire Damson	1889	Winter-killed, 1895-6			
67	Smith's Orleans	1898	Good; winter-killed, 1895-6; re-planted			
68	St. Cloud	1898	Good			
69	Trabische	1891	Very good; fruiting	May 29	June 4	June 10
70	Washington	1899	Good			
71	Western Seedling	1899	Bad			
72	White Damson	1898	Good			
	Cherries.					
73	Bessarabian	1898	Very good; winter-killed, 1895-6; fruiting	June 1	June 7	June 12
74	Dyehouse	1899	Bad			
75	Early Richmond } Not grafted	1889	Very good; fruiting	June 3	June 10	June 15
	or					
76	French Cherry } Grafted	1889	" "	" 1	" 6	" 11
77	Empress Eugenie	1898	Good "	" 3	" 9	" 15
78	Lutovka	1898	Very good; fruiting; winter-killed, 1895-6; re-planted	" 2	" 7	" 14
79	Montmorency	1889	Very good; fruiting	" 3	" 8	" 13
80	Ostheïm	1898	Bad			
81	Vladimir	1891	Winter-killed, 1895-6			
82	Windsor	1898	Good			
	Pears.					
83	Baba	1892	Winter-killed, 1895-6			
84	Bessemianka	1898	Bad; " "			
85	Flemish Beauty	1898	Good; " " re-planted			
	Apricot.					
86	Alexander	1898	Good; winter-killed, 1895-6			
	Strawberries.					
87	Sharpless	1889	Very good; fruiting	June 4	June 20	July 12
88	White Alpine	1889	" "	May 30	Blooms and bears fruit all summer	
	Blackberries.					
89	Lucretia Dewberry	1899	Good; winter-killed, 1895-6; re-planted			
90	Taylor	1899	Good			

Reference Nos.	Varieties Planted.	Colour.	Growth and Present Condition.	Remarks.
	Currants.			
91	White Grape	White	Very good; fruiting	The best to eat
92	Black Naples	Black	" "	
93	Champion	"	" "	The best for liquor
94	Victoria	"	"	
95	Fay's Prolific	Red	" fruiting	The nicest
96	North Star	"	" "	
97	Versaillaise	"	" "	The best bearer
	Gooseberries.			
98	Chautauqua	White	Very good; fruiting	Very large fruit
99	College	"	Good	
100	Columbus	"	Very good; fruiting	Very large fruit
101	Downing	"	" "	The best to eat
102	Golden Prolific	"	" "	
103	Keepsake	"	" "	
104	Pearl	"	" "	Very prolific
105	Smith Improved	"	" "	Very good to eat
106	Whitesmith	"	" "	Very large fruit
107	Houghton Seedling	Red	" "	The most prolific
108	Industry	"	" "	Hairy and largest fruit
109	Lancashire Lad	"	Good; fruiting	
110	Red Jacket	"	"	
	Raspberries.			
111	Golden Queen	Yellow	Very good; fruiting	
112	White Raspberry (French)	"	" "	The best to eat
113	Gregg	Black	Bad	
114	Antwerp	Red	Very good; fruiting	The best to eat
115	Marlboro'	"	" "	Largest and nicest

After the severe winter of 1895–6, which killed so many fruit trees, it was decided not to re-plant the following varieties of fruit as they were not promising.

Apples.—Antonovka, Blushed Calville, Charlottenthaler, Gipsy Girl, Golden White, Grand Duke Constantine, Louis' Favorite, Summer Arabka.

Pear.—Baba.

Plum.—Shropshire Damson.

Raspberries.—Japanese Wineberry, Stone's Hardy.

On the other hand, there are in the present list a number of varieties which had not yet been planted in 1895 and which are now being tested. The following is a list of these :—

Apples.—Ben Davis, Canada Baldwin, Canada Red, Grimes' Golden, Mann, Montreal Beauty, Ontario, Pewaukee, Red King, Salome, Wismer Desert, Wolf River, Yellow Transparent.

Plums.—Blue Imperial, Grand Duke, Gueii, Niagara, Pond's Seedling, Reine Claude de Bavay, Saunders, St. Cloud, Washington, Western Seedling, White Damson.

Cherries.—Dyehouse, Empress Eugénie, Ostheim, Windsor.

Currants.—Champion, North Star, Victoria.

Gooseberries.—College, Columbus, Golden Prolific, Keepsake, Lancashire Lad.

Blackberries.—Taylor.

Raspberries.—Golden Queen.

In this orchard, now planted for ten years, experience has shown, through many very bad seasons that the following varieties are *iron clad*, that is, most hardy and to be recommended in every respect for the north-eastern region of the Province of Quebec, such are :

Apples.—Alexander, Duchess of Oldenburg, English Golden Russet, Fameuse, Grandmother, Hare Pipka, McIntosh Red, Peach of Montreal, Red Astrachan, St. Lawrence, Titovka, Transcendent and Whitney.

Plums.—Blue Damson, Early Yellow, Reine Claude de Montmorency and Trabische.

Cherries.—Early Richmond, or French Cherry, on their own roots.

Small Fruits.—Almost all those mentioned in the general list given above.

ANOTHER NORTHERN ORCHARD.

The following is a report of another northern orchard, namely, that of Mr. W. Tremblay, Chicoutimi, Que. This report was read before the Quebec Pomological Society at its meeting in Montreal last winter. Mr. Tremblay lives in a very rigorous climate, where the temperature frequently falls to 38° F. below zero, and the information he gives of the success which he has had in growing and fruiting apples there should be of great value to those in his latitude in the Province of Quebec who may be contemplating the planting of fruit trees.

Latitude of Chicoutimi	48° 26′ Fahr.
Lowest temperature	38° Fahr, below zero.
Highest "	104° Fahr, above zero.
Climate	Very moist.
Snowfall	2 to 3 feet.
Situation of orchard	Surrounded by rocks, covered with trees, except on east side.
Soil	Sandy loam with clay subsoil, well drained.

'CHICOUTIMI, January 5, 1899.

'My first work dates from 1893. In that year I planted a Duchess apple tree and a Bradshaw plum ; the latter perished the following winter, but as the apple tree wintered well, I planted in the spring of 1894 three dozen apple and crab trees, comprising the following varieties :—Hyslop, Duchess, Yellow Transparent, Russian Transparent, Peach of Montreal, Red Astrachan, St. Lawrence, Golden Reinette, and Grimes' Golden, the two last named varieties not wintering well. I am testing some other varieties and to-day, notwithstanding a temperature every year nearly as low as 40° F. below zero, there are not less than twenty varieties succeeding in my orchard. Duchess, Yellow Transparent, Irish Peach, Winter Calville, Tetofsky, Hyslop, and Queen's Choice produced fine fruit in 1898.

'The winter of 1896–7 was exceptionally hard on fruit trees in this part of the province. Notwithstanding this fact, I did not loose a single tree during that winter, the growth of the previous year and the fruit buds, only, perishing. I have proven that a good number of varieties can stand a temperature of 40° F. below zero if the roots of the trees are well protected. It is first necessary, however, to let the ground

freeze to a depth of four or five inches. It sometimes happens, however, as was the case this year and last, that the snow falls before the ground freezes. It is then necessary to shovel the snow away and permit the ground to freeze to the required depth. Some snow and straw should then be placed about the base of the tree which will prevent alternate thawing and freezing before the fine weather comes in the spring. If the ground is thus kept frozen there is no danger of winter-killing. It is true that I have lost some trees, but this was more due to my neglect in not taking the proper precautions than to lack of hardiness of the trees.

'The following are the names of the varieties which are at present growing in my orchard:—Duchess, Yellow Transparent, Russian Transparent, Peach of Montreal, Irish Peach, Wealthy, Tetofsky, Scott's Winter, McIntosh Red, Wolf River, Winter Calville, Red Astrachan, McMahan White, Gideon, Lawver, Pewaukee, Ben Davis, Fameuse, Longfield, and Hyslop.

'I have lost the following varieties:—Northern Spy, Twenty Ounce, Canada Baldwin, and Golden Reinette.

'In conclusion, I think that it is possible to cultivate fruits very far north in our province, providing the roots of the trees are well protected, and that the soil remains frozen hard until after the first thaws in spring.

'I am now beginning to test some plum trees, in the hope of having similar success.

'W. TREMBLAY.'

SEEDLING FRUITS.

Owing, probably, to the fact that there were light crops of large fruits in most of the fruit-growing districts in Canada this year, the number of specimens received for examination was much less than last season. There has, however, come under our notice a few which are quite promising, descriptions of which will be found below. It is always gratifying to receive specimens from those who think they have a good variety of fruit, as by describing the best of them in this report it makes their existence known to fruit-growers and they can then be tested on a larger scale and their true value determined.

Record Number	Province.	Address of Sender.	Description of Fruit.
		APPLES.	
176	N.S. ...	Mrs. H. K. E. E. P. Baker, Kentville	Promising. See description of Beauty of Norton.
177	" ..	P. J. Potier, Belleville............	Splashed with purplish red; medium quality; late winter.
178	P.Q. ...	Asa Johnston, Cowansville..........	No. 1. Promising. See description.
179	" ..	" "	No. 2. " "
180	" ..	" "	No. 3. Unknown; greenish yellow, splashed with dull purplish red; season, late winter.
181	" ..	C. P. Newmann, Lachine Locks, P.Q.	Promising; see description.
182	" ..	A. A. Evans, Kingsey............	A small striped apple of inferior quality.
183	" ..	L. Roy, Camille..................	A large yellow winter apple with a pink blush; inferior quality.
184	" ..	R. Hamilton, Grenville...........	De la Salle apple. See description.
185	Ont....	S. P. Morse, Lowville...............	No. 17. Seedling; above medium size; streaked with bright red; poor quality.
186	" ..	W. Grady, Annan..................	A sweet apple of good quality; late winter.
187	" ..	J. P. Cockburn, Gravenhurst	'Minto.' See description.
188	" ..	Wm. Mowbray, Sarnia..............	Splashed and streaked with red; medium quality; season, winter.
		PEARS.	
189	" ..	Miss Lilian A. Trotter, Owen Sound.	Promising seedling pear. See description.
		PEACHES.	
190	" ..	E. D. Smith, Winona...............	'Millionaire.' See description.

Record No. 176. Apple seedling 'Beauty of Norton': Tested Nov. 18, 1899:—from Mrs. H. K. E. E. P. Baker, Kentville, N.S.

Description.—Very large, roundish, conical; skin pale yellow, splashed and washed with red, mostly on sunny side; dots few, pale, obscure; cavity deep, open; stem short stout; basin deep and narrow; calyx open. Flesh yellow, tender, juicy, melting, mild sub-acid. Core, medium size; skin moderately thick, tender. Quality good; season November. Probably a seedling of Gravenstein. Mrs. Baker says that the tree was found growing near the railroad when about 4 feet high, and transplanted to its present position about fifteen years ago. It bears a good crop every year and is not subject to disease. It is good either for dessert or culinary purposes. The specimen received weighed 9½ ounces and measured 3½ by 3 inches in diameter. A specimen sent, but which was not received, was said to measure 14 inches in circumference.

Record No. 178. Apple seedling (No. 1.) Tested Feb. 4, 1899. From Asa Johnston, Cowansville, Que.

Description.—Medium size, roundish, slightly elongated, regular, smooth; skin yellow, almost covered with bright red; dots few, yellow, distinct; cavity shallow, narrow; stem short, stout; basin narrow, medium depth, smooth; calyx open. Flesh yellow, juicy, mild sub-acid, peculiar but not unpleasant flavour. Core small; skin moderately thick, tender; quality above medium. A very handsome apple and a good keeper.

Record No. 179. Apple seedling No. 2.) Tested Feb. 4, 1899. From Asa Johnston, Cowansville, Que.

Description.—Medium size, oblate, slightly conical; skin yellow, nearly covered with bright red; dots fairly numerous, yellow, distinct; cavity deep, open; stalk short, moderately stout; basin narrow, shallow, smooth; calyx partly open. Flesh yellowish, tender, juicy, sub-acid; core small, stem moderately thick, tough, quality good. A good keeper. Promising, Scions received 1899.

Record No. 181. Apple seedling. Tested Nov. 15, 1899. From R. Hamilton, Grenville, Que. Specimens taken from orchard of C. P. Newmann, Lachine Locks, Que.

Description.—Medium to large, oblate to slightly conical, ribbed; skin pale green, almost, and sometimes covered with dark red; dots numerous, small, yellow; cavity deep, moderately open, slightly russetted; stem short, moderately stout; basin medium depth and width; calyx closed. Flesh white, tinged with red near skin, moderately juicy, sub-acid, slightly astringent, pleasant but not high flavoured. Core medium size. Skin thick and tough. Quality above medium. Season, December and January. Scions asked for. From an old seedling tree in the orchard of C. P. Newmann, Lachine Locks, Que.

Record No. 184. Apple seedling 'de La Salle.' Tested Dec. 20, 1899. From R. Hamilton, Grenville, Que.

Description.—Above medium size, roundish, skin pale yellowish-green, splashed and washed with bright red and carmine, mostly on sunny side; dots few, gray, obscure; cavity deep, medium width, russetted; stem medium length, moderately stout; basin deep, wide, slightly wrinkled; calyx open. Flesh yellow, firm, crisp, juicy, sub-acid, pleasant flavour. Core medium size. Skin thick and moderately tough. Quality good. Season, January to May. Promising. Original tree stood on the farm of John Fraser near Lachine, Que. Scions asked for.

Record No. 187. Apple seedling 'Minto.' Tested Nov. 14, 1899. From J. P. Cockburn, Gravenhurst, Ont. Grown by Rev. Wm. Reeve, Gravenhurst, Ont.

Description.—Medium size, roundish, broadly ribbed; skin pale green, splashed and washed with dull dark red, mostly on sunny side; dots few, green, distinct, but

not prominent; stem short, moderately stout; cavity deep, narrow; basin medium depth and width, slightly wrinkled; calyx closed. Flesh white, crisp, tender, juicy, mild sub-acid, pleasant but not high flavoured; core medium size; skin moderately thick. Quality good. Probably season of Fameuse. Tree said to be about 10 years' old, very hardy, and an annual bearer. Not desirable where Fameuse and McIntosh Red will succeed, but if hardier than these trees it may prove valuable.

Record No. 189. Pear seedling. Tested Sept. 11, 1899. From Miss Lilian A. Trotter, Owen Sound, Ont.

Description.—Below medium size, obovate, obtuse pyriform; skin yellow with a pink blush on sunny side; dots numerous, small, brown; cavity broad and very shallow; stem medium length, stout; basin narrow, shallow. Calyx open. Flesh yellowish, moderately juicy, buttery, sweet, high flavour. Quality very good. A little over ripe at this date. Tree grown from seed by the late Richard Trotter, Owen Sound, Ont.; said to be a healthy, rapid grower. Fruited for the first time in 1898, when there was one pear. Fair crop in 1899. Promising. Scions received 1899.

Record No. 190. Peach 'Millionaire.' Tested Sept. 12, 1899. From E. D. Smith, Winona, Ont.

Description.—Large, roundish, skin rich yellow, with a purplish red blush on sunny side; suture shallow, obscure except near cavity, where it is distinct. Flesh yellow, very juicy, sweet, rich; stone medium size. Freestone. Quality very good. Season, immediately after Early Crawford. Promising.

SPRAYING.

The trees, shrubs, and plants were thoroughly sprayed this year as in previous years, as a result of which comparatively little injury was done by fungous diseases or insects. The Tent caterpillars and Forest Tent caterpillars which did so much damage to fruit trees in Ontario and Quebec this year, were killed here by spraying the trees with Paris green shortly after they were hatched and before they had done much damage.

EXPERIMENTS IN WHITEWASHING TREES.

In a bulletin prepared by Mr. John Craig, late Horticulturist of this farm, on 'Peach Culture in Canada' (Central Experimental Farm, Bulletin No. 1, Second Series, September, 1898), he quotes from a bulletin published by Prof. J. C. Whitten, Horticulturist at the Missouri Agricultural Experiment Station, some interesting results which were obtained at that station in preventing the swelling of peach buds by whitewashing the trees. As no experiments had yet been conducted here to corroborate the results obtained in Missouri, and as the winter-killing of the fruit buds of the peach is a matter which interests many of our own fruit growers, it was thought desirable that we should be in a position to state whether the results obtained by Prof. Whitten could be had here or not. To make the matter as clear and concise as possible, I cannot do better before giving the results of our experiments here, than quote Prof. Whitten's summary of his work from Bulletin No. 38, Missouri Agricultural Experiment Station:

'I....In this latitude, winter-killing of the fruit buds of the peach is usually due to the unfavourable effects of freezing after they have been stimulated into growth by warm weather, during winter or early spring.

'II....The early swelling and growth of the buds is due to the warmth they receive, is practically independent of root action, and may take place on warm sunny days in winter, when the roots are frozen and dormant.

'III....Peach fruit buds may safely endure a temperature of ten or twenty degrees below zero, providing they mature well in autumn, are entirely dormant, and the cold comes on gradually.

'IV....Zero weather may kill fruit buds that have swollen during previous warm weather, or that were not properly ripened in the autumn.

'V....Shading and whitening peach trees to prevent their absorbing heat on sunny days opposes growth of the buds and is, consequently, a protective measure.

'VI....Shading the trees with board sheds enabled peach buds to survive the winter uninjured, when eighty per cent of unprotected buds were killed.

Trees protected in this way blossomed later, remained in bloom longer, set more fruit in proportion to the number of apparently perfect flowers, and held their fruit better than any other trees on the station grounds. This is the most effective means of winter protection tried at the Station, but it is probably too expensive for commercial orchards.

'VII....Whitening the twigs and buds by spraying them with whitewash is, on account of its cheapness and beneficial effects, the most promising method of winter protection tried at this station.

'VIII....Whitened buds remained practically dormant until April, when unprotected buds swelled preceptibly during warm days late in February and early in March.

Whitened buds blossomed three to six days later than unprotected buds. Eighty per cent of whitened buds passed the winter safely, when only twenty per cent of the unwhitened buds passed the winter unharmed.

'IX....Thermometers covered with purple material registered, during bright sunny weather, from ten to over twenty degrees higher than thermometers covered with white material of similar texture, thus indicating that whitened peach twigs might be expected to abso rb much less heat than those which were not whitened.'

Not having any peach trees at Ottawa on which to try the experiment, the test was confined to plums, cherries and apples, the number of trees used being: plums five, cherries three, apples six.

The whitewash was made by using unslaked lime, skim milk, and water in the proportion of:

Skim milk....................................	6 gallons.
Water..	24 "
Lime...	60 lbs.

The lime was slaked in warm water and the remainder of the liquid added and the whole thoroughly stirred. It was then strained through an one-twelfth inch mesh and was ready for use. As the experiment was not on a very large scale, a hand pump was used with a Bordeaux nozzle, which worked very satisfactorily. The first spraying was given on February 16, and successive sprayings were made on February 21 and 25, March 1, 10, 13, and April 1, six in all, the object being to keep the trees pure white from top to bottom until warm weather came in the spring.

The following notes were taken at intervals from the latter part of the winter until warm weather:

Plums: April 5.—No apparent swelling of the buds on either sprayed or unsprayed trees.

April 15.—No apparent swelling of the buds on sprayed or unsprayed trees.

April 20.—Buds on unsprayed trees very slightly swollen; buds on sprayed trees still apparently dormant.

April 24—Buds on unsprayed trees of *Americana* class slightly swollen; on sprayed trees just perceptibly. Buds still apparently dormant on sprayed and unsprayed trees of *domestica* class.

April 28.—Flower buds on American plums now showing quite generally on unsprayed trees, a few flower buds showing on sprayed trees, but difference very decidedly marked; not so much swollen. Buds on unsprayed European plums just starting perceptibly; on sprayed trees, still apparently dormant.

May 2.—Flower buds now exposed in both sprayed and unsprayed trees, but difference more marked than before. Greater contrast in buds on unsprayed and sprayed trees of European plums. Buds on sprayed trees have only swelled slightly.

Temperature was above 80° F. on April 30 and May 1 and 2, causing rapid swelling of buds. Impossible now to keep buds covered with lime unless sprayed every day. Last spraying was given on April 30.

The dates of blooming of the plums sprayed and unsprayed were:

Jessie (American)	unsprayed	May 22
"	sprayed	" 24
Early Red (European)	unsprayed	" 13
"	sprayed	" 22

A considerable number of blossom buds on the Jessie plum were killed by the whitewash, but the plums on the sprayed trees were larger than on the unsprayed, and there was the same quantity of fruit on it as on the unsprayed tree. The two trees were about the same size.

There were only a few blossoms on both sprayed and unsprayed trees of the Early Red plum. There were about the same number of blossoms on both trees.

A tree of a hybrid between the Sand Cherry and the American plum in the Director's garden was sprayed with the whitewash and a considerable number of buds were killed by the wash.

Cherries: April 5.—Buds on unsprayed trees swollen very slightly; on sprayed trees still apparently dormant.

April 15.—Buds on unsprayed trees swollen slightly; on sprayed trees, still apparently dormant.

April 20.—Buds more swollen on unsprayed trees; on sprayed trees, starting to swell. A tree, part of which was sprayed and part unsprayed, has buds more swollen on unsprayed part than on sprayed part.

April 24.—Difference between sprayed and unsprayed cherry buds very apparent now.

April 28.—Still greater difference between sprayed and unsprayed buds, though sprayed have swollen considerably.

May 2.—Still a marked difference between sprayed and unsprayed.

There were no flowers on either sprayed or unsprayed trees. There was no apparent injury from the use of the whitewash on the trees.

Apples: April 5.—Buds apparently still dormant on sprayed and unsprayed trees.

April 15.—Buds apparently still dormant on sprayed and unsprayed trees.

April 20.—Buds on unsprayed trees very slightly swollen; on sprayed trees, still apparently dormant.

April 24.—Although buds were thought to be slightly swollen on the 20th, on unsprayed trees, no perceptible swelling is noticed to-day. Buds on sprayed trees still apparently dormant.

April 28.—Buds swollen slightly on both sprayed and unsprayed trees.

May 2.—Buds are still only slightly swollen on sprayed and unsprayed trees; no apparent difference.

The results here given are sufficient evidence of the fact that the retarding of the swelling of the buds was quite marked on trees of plums and cherries, but the difference in the dates of blossoming was very slight. A considerable number of the blossom buds of the plums were killed by the whitewash. As the buds on apple trees do not swell until late, the whitewash appeared to have little effect in retarding the swelling of them. I am not yet prepared to say whether it would be practical, beneficial, or advisable to spray peach trees to prevent the winter-killing of the buds.

EFFECT OF LIME ON THE OYSTER-SHELL BARK-LOUSE.

Notwithstanding the thorough sprayings which the trees in the orchard at the Experimental Farm receive, the oyster-shell bark-louse, which has infested the apple trees for several years, has never been entirely destroyed.

Last summer when the whitewash came off the trees which had been sprayed in the experiment to determine what effect whitewashing trees would have in preventing the swelling of the buds, we were surprised to find that the trees were practically free of the oyster-shell bark-louse. All the old scales had disappeared, the bark of the trees was brighter and cleaner, and they had all a healthier apperance than those under the same conditions but which had not been sprayed with whitewash. None of the whitewashed trees, however, had been examined for bark lice before they were sprayed, but considering the fact that the remaining seventy-two trees of Wealthy, thirty-one of Duchess, twenty-six of Tetofsky are all from slightly to badly infested with old scales there is, I think, ample evidence of the wonderful effect of the whitewash on this insect.

EXPERIMENTS WITH LIME IN PROGRESS.

Experiments are now in progress at the Farm with trees infested with oyster-shell bark-louse, and at Niagara on trees affected with San José and New York scales, to determine, if possible, the best time to whitewash the trees to get the best results, the number of applications necessary, how long before the whitewash takes effect, and any other points which may come up. It will be interesting to learn what effect lime will have on the San José scale.

The formula used this winter is:

6 gallons skim milk,
30 " water,
60 lbs. lime,
10 lbs. salt.

It may be found that a much thinner wash will be as effective; made by the present formula, it is very thick and has to be kept thoroughly stirred.

The use of lime in whitewashing the trunks and large limbs of trees is an old custom and still adopted by a few. It was supposed to have a generally beneficial effect on the tree, but I have not yet been able to learn just what effects it really had.

Lime was recommended by Forsyth in 1802 for the destruction of aphis and red spider. His formula was:

Unslaked lime	½ peck
Water	32 gallons

It was applied by means of a syringe.

Air-slaked lime is used successfully in destroying slugs on the foliage of trees.

Lime was recommended in 1850 against the Curculio of plums by Lawrence Young, Louisville, Ky., and it was said to have been used successfully by him. 'It consists simply in covering the young fruit as soon as danger is apprehended with a coating of thin lime wash, considerably more dilute than the mixture used in whitewashing.'

In Bailey's Horticulturist's Rule Book, we find lime spray recommended to prevent the attacks of the rose chafer. The formula reads: 'Slake ½ peck, or a peck, of lime in a barrel of water, straining the lime as it enters the barrel, to prevent its clogging the pump. Apply in a spray until the tree appears as if whitewashed.'

Messrs. H. Lutts & Son, Youngstown, N.Y., U.S., have been very successful in destroying the pear tree psylla by means of lime. I quote from a letter received from Mr. H. Lutts, dated December 29, 1899:

'Replying to your inquiry regarding our using whitewash for pear tree psylla, would say that we commenced using it on this principle, to destroy the brood that wintered over, believing that every adult that we destroyed we were gaining a great point, and after three years experimenting we believe we were right.

'Our plan has been to scrape off all rough bark any time in December when it is freezing, and the colder the better. We spread a canvas under the trees and save all the scrapings and insects and immediately burn all up.

'We then give the trees, as far up as we can, a good thorough coating of thin slushy whitewash, made of freshly slaked lime that has been run off in a putty state as masons usually hold it for plastering purposes, thin with skim milk. This we put on with a

brush; for the balance of the tree not reached with a brush we thin this same wash with milk, and spray the tree completely. We believe by this process to have accomplished two things: first, we have destroyed a larger proportion of the hibernating psyllas and many of those not destroyed are so well sealed up that they cannot escape to lay their eggs during the first few warm days of April. We spray again in March to coat the wood and buds over so thoroughly that when the few that are alive attempt to lay their eggs they will not find many favourable places. The orchard in which we have been thorough in has no signs of psylla in it now. We are confident that it is more effectual than kerosene or kerosene emulsion, both of which we have tried thoroughly. The orchard where we experimented contained 1,000 trees and was virtually ruined with psylla. Since we began using lime it has steadily regained its vigour, and to-day it will be hard to find its equal for brightness or apparent vigour. We do not like to recommend this to everyone as we believe much depends on the thoroughness of the scraping and the thorough whitewashing. Many that attempt to fight the psylla on those lines will fail, no doubt, but our trees tell us that the plan is all right, and we have given you the principal points and hope if you experiment you will favour us with your reports.

'Yours truly,

'(Signed.) HENRY LUTTS.'

Prof. J. C. Whitten, Horticulturist, Missouri Agricultural Experiment Station, informs me that limewash prevents peach curl.

No where have I found that trees have been whitewashed for the sole purpose of killing scale insects.

While the results obtained seemed to prove the value of lime as an insecticide, we do not advise using it extensively until further experiments furnish more data.

SPRAYING TO DESTROY OYSTER-SHELL BARK-LOUSE.

Last spring all the apple orchard with the exception of the trees which had been whitewashed, received two sprayings for the purpose of, if possible, destroying this pest. Careful watch was kept for the day when the young lice made their appearance, which was on May 29. On June 1, the trees received a spraying of tobacco water and whale oil soap, made by using 10 pounds tobacco and 2 pounds whale oil soap to 40 gallons of water. Specimens of the young insects were examined under the microscope and were found to be dead within an hour of the time they were sprayed. On June 6, the trees were sprayed a second time with whale oil soap, 8 pounds to 40 gallons of water. This was to kill all that were left. Although their numbers were greatly reduced, there must have been a considerable number escaped, as healthy scales were found in the orchard later in the summer.

'DRY ROT,' 'BROWN SPOT,' OR 'BALDWIN SPOT' OF THE APPLE.

In the report of the Horticulturist for 1896 some notes were published on 'A Dry Rot of Apples.' This apparent disease of the apple had been first brought under the notice of the Horticulturist in 1895, when it affected the fruit in the orchards at the Central Experimental Farm, and when specimens of diseased fruit were received from various parts of the Dominion.

As this dry rot was well described in the report for 1896, the same description may be used with advantage here:

'The disease was manifested exteriorly by small circular depressions on the surface or skin of the apple. These depressions were $\frac{1}{8}$ to $\frac{1}{4}$ of an inch deep and $\frac{1}{4}$ to $\frac{5}{8}$ of an inch in diameter. On removing the skin of the apple it was found that each depression was the centre of a small area of dryish brown tissue. In some varieties, badly attacked, this brown and pithy tissue extended in a more or less complete network over the whole

Apple Tree Sprayed with Lime Mixture, Central Experimental Farm, Ottawa.

Plantation of Tobacco, Central Experimental Farm, Ottawa.

surface of the apple. Its texture was dry and tough enough to prevent it from being cut into easily with anything but a keen edged blade. The flesh of the apple was rarely affected to a depth of more than ⅜ or ½ an inch. The affected flesh was dry and flavourless, but not bitter. While the apple was not rendered wholly unfit for use, its appearance and salability were totally destroyed.'

During 1897 and 1898 this dry rot has affected nineteen varieties of apples at the Experimental Farm, and some crops have been so badly injured that the fruit was almost all worthless. Although the trees have been thoroughly sprayed, the fungicides appeared to have no effect.

In order to get information which might lead to learning the cause of this rot—for up to this time no germs of disease which seemed to have caused this rot have been found by any bacteriologist, to our knowledge—a circular was prepared and sent out on October 25, 1899, to prominent fruit growers in many parts of Canada, and to the horticulturists of all the agricultural experimental stations in the United States. The following is a copy of the circular:—

EXPERIMENTAL FARM,
OTTAWA, October 25, 1899.

DEAR SIR,—I desire to obtain as much information as possible regarding a dry rot of apples (the same as is described in the report of the horticulturist for 1896, page 171), and should be much obliged if you would assist me by answering the questions enumerated below, if the disease has come under your notice.

The disease is indicated by small depressions on the surface of the fruit, under which the flesh is of a brownish colour. It frequently spreads throughout the apple, rendering it almost, or quite, worthless. It does not taste bitter (and in that respect there is a marked difference between it and the Bitter Rot), but the flesh becomes dry and flavourless.

1. For how many years have you observed this disease?...... 2. What varieties has it affected? ..... 3. Are the trees in a healthy condition?...... 4. Have you sprayed your trees thoroughly with Bordeaux mixture, and, if so, with what results as regards this disease?...... 5. What kind of soil are the affected trees grown in? Surface and subsoil?...... 6. How frequently do you fertilize your trees, and what fertilizer do you use?...... 7. What is your system of cultivation?...... 8. Do you think the soil contains all the necessary elements of plant food in a form made easily available?...... 9. What is your opinion of the cause of this disease?......

I shall be pleased to receive samples of affected fruit.

Yours very truly,

W. T. MACOUN,
Horticulturist.

In response to these inquiries, 63 replies were received, and a synopsis of the information obtained is given herewith:—

Number who have observed the rot, thirty-five.

Number who have not observed the rot, twenty-eight.

Length of time rot has been observed, twenty-eight years.

Number of varieties affected, sixty.

Provinces in Canada where rot has been observed: Nova Scotia, Quebec, Ontario, British Columbia.

Provinces in Canada where rot has not been observed: Prince Edward Island, New Brunswick.

States in the United States where rot has been observed: New York, Vermont, New Jersey, Maryland, Massachusetts, North Carolina, West Virginia, Pennsylvania, Michigan, Minnesota, Maine.

States in the United States where rot has not been observed: Alabama, Louisiana, New Mexico, Arkansas, Arizona, Oklahoma, Indiana, Missouri, Iowa, Wyoming, Montana, California and Oregon.

Provinces in Canada where disease appears to be most prevalent : Ontario (Eastern), Quebec, British Columbia.

States in the United States where disease appears to be most prevalent: New York, Vermont, New Jersey, Maryland.

Causes assigned by growers :—

1st.—Want of vigour of tree.
2nd.—Want of moisture in soil.
3rd.—Fungous disease.
4th.—Want of potash and lime in soil.

Causes assigned by bacteriologists :—Physiological.

Samples of affected fruit have been submitted to Dr. Connell, Queen's University, Kingston, Ont., who has given this rot considerable study. He could not find any ungus which appeared to cause this rot.

Prof. L. R. Jones, Botanist of the Vermont Agricultural Experiment Station, who has given more attention to this subject than, perhaps, any other man in America, and who published some information regarding it in 1891, has recently published the results of his latest investigations which, while seeming to prove that the trouble is physiological, do not yet make it clear as to why the rot should occur.

The following are some quotations from his report, which give some information not found in the report for 1896 of the Horticulturist of this Farm :—

Re-examination of these brown spots has been made by us on various occasions since our earlier publication. In most cases, especially in the autumn and early winter, no fungus has been detected in the browned tissues, and it has, therefore, become evident to us that the spotting was not primarily a fungous disease.

Having opportunity at this stage of the study to confer with the officers of the Division of vegetable physiology and pathology of the United States department of agriculture it was learned that Mr. M. B. Waite and Dr. E. F. Smith had made observations upon a similar spotting of apples which they were satisfied was a non-parasitic disease and which Dr. Smith considered identical with a dry spot disease described by Wortmann as occurring in Europe.

The examination of Wortmann's paper[1] leaves no doubt that the disease discussed by him under the name "Stippen" or "Stippich-werden" is identical with the brown spot of the Baldwin, although the Baldwin did not chance to be among the varieties included in his studies.

Wortmann's work has been recently critically reviewed and his conclusions re-affirmed and somewhat extended by Bschokke.[2] Numerous experiments were devised and conducted by Wortmann and others by Bschokke in connection with their studies which satisfied them of the correctness of their conclusions.

1 Wortmann, Ueber die sogenannte, "Stippen" der Aepfel. Landw. Jahrb., 21, pp. 663-675 (1892).

2 Bschokke, Landw. Jahrb. d. Schweiz, 11. pp. 192, (1897). This author gives a very complete bibliography of the German literature of the disease.

Occurrence.—The trouble is of widespread occurrence both in Europe and America. It is worse on some kinds of apples than on others; and upon the same kind its occurrence varies with climatic or cultural conditions, and probably with those of storage. Wortmann states that large, sappy varieties and specimens are most liable to spot.

The variety pre-eminently subject to it in the Northern United States is the Baldwin. It has already been stated that it is of frequent occurrence on Northern Spy, in Vermont, and not rare on Greenings. Selby records the occurrence of the Baldwin spot in Ohio and also that of a brown spot on Northern Spy and other varieties.

Wortmann records the trouble as occurring in varying degrees upon numerous varieties in Europe as follows: Red Reinette, Golderling, Woltman's Reinette, Hawthornden, Winter Pearmain, Landsburger Reinette, Stettin, Dantziger.

Cause.—Neither fungi nor bacteria are to be found in the earlier stages of the spot formation nor is there a constant occurrence of any such organism in the latter stages. It is therefore a non-parasitic disease

Wortmann's observations and experiments lead him to conclude that the death of the cells in these spots is a result of the concentration of the sap following the loss of water. This water may be lost by direct transpiration in the case of the superficial cells, or in case of the deeper cells by excessive conduction of the water to the transpiring surface layers. The acidity of the concentrated sap is considered to be the direct cause of the injury, this injury being followed by the browning through oxydization.

Several factors may therefore enter into the problem of spot formation.

1. The amount and rapidity of transpiration. This is dependent upon the character of the epidermis, conditions of storage, etc. The fact is emphasized that *gradual* loss of sap is essential to the formation of typical spots. Thus a specimen of a variety which is subject to spot will shrivel without the appearance of spots if kept in a warm dry room. Wortmann suggests that in case of such very rapid loss of water the acid of the concentrated sap has insufficient time to act.

2. The kind and relative amount of substances in solution in the cell sap. The same degree of concentration of different solutions may not be equally injurious, hence the actual per cent of water lost in spotting and non-spotting varieties may not stand in a direct relation to their susceptibility to the disease.

3. The conductivity of the tissues of the fruit. The original loss of water must always occur at the surface. The death of these surface cells may ultimately follow unless this loss is made good by the conduction to them of water from the underlying tissues. In some varieties this conduction occurs more rapidly than in others. Wortmann found that in varieties subject to spot there was relatively slow water conduction.

Bschokke considers this relative rate of water conduction to be the most important factor in deciding the susceptibility of a given variety to the spot disease.

4. The specific resistance of the protoplasm of the cells to the injurious action of the concentrated sap. This is probably greater in some varieties than in others, and it may vary also with climatic and other cultural conditions.

Remedies.—Wortmann concludes that the spotting of susceptible varieties cannot be prevented entirely, but that, since trees which are improperly cared for produce fruit of less resistance toward unfavorable influences of every sort, proper attention to fertilization and general cultural conditions is called for. He believes that moist cloudy weather, which decreases starch formation, favors the disease and that in seasons where such weather predominates an excess of nitrogenous fertilizer is especially unfavorable. He recommends a dry sunny exposure and pruning so as to admit sunlight. On theoretical grounds he believes that storage in a moist atmosphere with uniformly low temperature will lessen the development of the spots He also suggests the probable protection which would come from wrapping the apples separately in paper to check transpiration.

Bschokke revives a suggestion from the older literature that, since apples which have lost a considerable moisture from their superficial tissues by rapid evaporation do not spot, some treatment involving this method might be employed in bad cases. It is doubtful if this will commend itself in actual practice, although it has some theoretical interest.

Lamson finds that spraying Baldwins with bordeaux mixture—about as recommended for the scab fungus—reduces the amount of spotted fruit to a remarkable degree.

*The following is a summary of his results :

Prevention of brown spot of Baldwin by spraying with bordeaux mixture.		Per cent of spotted fruit Sprayed	Unsprayed.
1895	Sprayed once before and twice after blossoming	3	55
1896	Sprayed once before and once after blossoming	10	68
	Sprayed once after blossoming	18	68
1898	Sprayed once before and twice after blossoming	22	52

These results are certainly very striking. In view of the above explanations of the cause of this disease the question of why spraying should check the tendency to spot becomes a matter of a considerable practical as well as theoretical interest.

CONCLUSIONS REACHED THUS FAR.

1. The Dry Rot, "Brown Spot," or "Baldwin Spot" affects at least 60 varieties of apples, and is thus not confined to only a few sorts. The Baldwin appears to be worse affected, but this may be due to the fact that it is grown more extensively than any other variety in those parts where the rot is most prevalent.

2. Its range extends from the Atlantic to the Pacific ; it appears, however, from data received, not to be found in Prince Edward Island, New Brunswick, and the southern and south-western States, although it may be there also.

3. It appears to be most prevalent in Eastern Ontario, Quebec, British Columbia and the Eastern States.

4. Opinions of growers differ very much as to the cause of the rot.

5. The results of the investigations of Jones, Wortmann and Bschokke seem to throw most light on the cause of the rot.

6. No remedy has yet been found for this trouble.

Acknowledgments :—In addition to all the fruit growers who have been good enough to furnish me with information regarding the dry rot, I am much indebted for valuable information to Dr. Connell, Kingston, Ont. ; Prof. L. R. Jones, Burlington, Vt., US. ; Prof. C. O. Townsend, College Park, Md., U.S., and to Mr. F. C. Stewart, Geneva, N.Y., U.S., who have made microscopical examinations of this rot.

* N. H. Exp. Sta. Buls. 45, (1897) and 65 (1899).

COVER CROPS.

Since 1895, orchard cover crops have received much attention at the Central Experimental Farm, and in the reports of the Horticulturist for 1896, 1897 and 1898, considerable space has been devoted to this subject; but the importance of cover crops in the orchard cannot be too often nor too strongly impressed upon the fruit growers of Canada. After the disastrous effects of last winter on fruit trees in some parts of Ontario, the fruit growers living in those districts must realize more than ever before, perhaps, how necessary it is to have some protection for the roots of their trees.

It is now quite generally conceded that cultivation should cease in orchards in Eastern Canada about the middle of July. At this time the season's growth is well advanced and the ripening of the wood soon begins. The seed which is to produce the future cover crop should now be sown. In Eastern Ontario, the common red or mammoth red clover, sown broadcast at the rate of 12 pounds to the acre, will probably make the most satisfactory cover crop. It will reach a height of from 10 to 12 inches by winter, and will form a dense mat of foliage which will make a thick mulch, thus preventing the alternate freezing and thawing of the ground which occurs in late winter or early spring, and which often proves so disastrous to trees. After the seed is sown, the soil should be rolled with a heavy land roller, which will cause the moisture to rise to the surface of the soil and assist the germination of the seed. This rolling is very important, as should the seed lie in the ground for any length of time without germinating, there will not be time for a good cover crop to be formed before winter. No nurse crop is, as a rule, necessary. In places where the soil is very dry, lucerne or alfalfa might be sown with advantage, as the seed of this clover appears to germinate more readily than that of the common red clover. Cow peas and crimson clover may be used in the warmer parts of the country.

Another advantage of clover growing in an orchard in autumn, is that much of the plant food in the soil which has been liberated and made more easily available by the constant cultivation during the early part of the summer, is prevented from leaching by being used by the growing plants, the clover thus becoming a 'catch crop,' as well as a cover crop.

Where soils suffer from lack of moisture in a dry time, the clover should be ploughed under as early in the spring as the land can be worked, and cultivation begun at once. This will conserve much of the moisture which would otherwise be transpired through the leaves of the growing plants until they were ploughed under towards the end of May, which is the usual time. If the soil, however, always contains plenty of moisture, it would be better to let the clover grow until about the third week of May, as there would be additional humus and nitrogen obtained by this method.

The great improvement made in the soil by the annual ploughing under of clover crops is clearly shown in figures given by Mr. G. T. Powell, Ghent, N.Y., U.S., at the last annual meeting of the Ontario Fruit Growers' Association. After crimson clover, which had been used as a cover crop—had been ploughed under in an orchard for three years, the soil was analyzed and the following differences were found between that where the clover had and had not been ploughed in:—

	Clover ploughed under for three years. Per cent.	No clover ploughed under for three years. Per cent.
Water............	15·00	8·75
Nitrogen..........	·21	·12
Humus..........	2·94	1·91
Phos. acid..........	·015	·008

The gain per acre would be:—

Water	6·25 per cent	=46,875 tons.
Nitrogen	·09 "	= 1,350 lbs.
Phos. acid	·007 "	= 105 lbs.

Although such good results might possibly not be secured by the use of red clover, still the improvement in the land by such treatment would be very great.

For the reasons mentioned in my report for 1898, the methods which are recommended above have not been adopted at the Central Experimental Farm since the spring of that year. Clover is used for a cover crop, but it is only ploughed under every two years. As the soil here is light and lacking in humus, but apparently contains plenty of moisture, a system of cutting the clover with a field mower and leaving it to rot in the orchard, has been followed. In 1898 five cuttings were obtained, the clover being from eighteen to twenty inches high at each cutting and just coming into bloom. It was estimated that from the first four cuttings 25 tons per acre of green crop were left lying on the field. Clover sown in 1898 was cut four times this year, and the crop from each cutting appeared fully as good as that of last year. It can easily be imagined that this is improving the soil rapidly.

Common Red Clover was sown in the orchards this year on May 10, 17, 25 and 31; July 4, 11, 18 and 25. There was a good cover crop obtained from all of these sowings, with the exception of that on May 31, which did not germinate well, and from those of August 2, 9 and 16 at which time the weather was very dry and the seed did not germinate until September, and then but thinly. Clover sown on May 17 and 25, was nearly smothered by purslane, but eventually overtopped it and came on well and formed a good cover crop by autumn.

In a part of the apple orchard where the soil is very poor, two green crops were ploughed under this summer. On June 10, clover which had formed a cover crop the previous winter was ploughed under and the land was then re-sown with buckwheat, soja beans, English horse beans and field pease, with the following results:—

Buckwheat sown broadcast on June 17, at the rate of 2 bushels per acre; came up June 23. Ploughed under on July 25. Average height 27 inches. Estimated yield per acre of green crop: 8 tons 335 pounds.

Soja Beans:—sown in drills 6 inches apart on June 17, at the rate of 3 bushels per acre, came up June 24. Ploughed under on August 7. Average height 14 inches. Estimated yeield per acre of green crop: 3 tons 466 pounds.

English Horse Beans:—Sown in drills 6 inches apart on June 17, at the rate of 4 bushels per acre, came up on June 27. Ploughed under on August 7. Average height 18 inches. Estimated yield per acre of green crop: 6 tons 592 pounds.

Field Pease:—Sown in drills 6 inches apart on June 17, at the rate of 3 bushels per acre, came up on June 24. Ploughed under on July 29. Average height 26 inches. Estimated yield per acre of green crop: 5 tons 1,191 pounds.

After these crops were ploughed under the land was re-seeded with clover on August 2, 9 and 16, in the hope of getting a cover crop by winter, but owing to nearly six weeks of very dry weather about that time the seed did not germinate until September and a cover crop was not formed. The trees in this part of the orchard have been mulched with manure.

On July 6, English horse beans were sown in a part of the orchard where the soil was light and where the snow does not lie well in winter. On July 16, after the beans were up, common red clover was sown among them at the rate of 12 pounds per acre. The beans reached a height of 18 inches by autumn and helped very much to hold the snow while they must have gathered much nitrogen during the growing season. There is also a good stand of common red clover.

On July 25, Lucerne clover was sown in a part of the orchard where the soil was very light. It reached a height of from 7 to 12 inches by autumn, and although there was a large number of plants destroyed by a storm carrying away the surface soil, there is a fairly good cover crop.

RELATIVE DATES OF BLOSSOMING OF DIFFERENT VARIETIES OF APPLES.

During the past five years the dates of blossoming of large and small fruits have been recorded by a large number of observers in different parts of Canada for this

Division. In 1895, Mr. John Craig, then Horticulturist of the Central Experimental Farm, inaugurated this work. The following circular, which was sent out by Mr. Craig to those whom he asked to assist him states clearly the reasons why the information he desired to get should prove of much value to fruit growers throughout Canada :—

"Dear Sir :—The cause of the unfruitfulness of some varieties of large and small fruits when planted in large blocks by themselves is now understood to be due to self-sterility, complete or partial, causing imperfect pollination and fertilization. The remedy is the intermingling of varieties in the orchard for the purpose of securing cross-fertilization. To obtain the best results, the varieties adjacent to each other should blossom at or about the same time.

Accurate information with regard to time of the blossoming of the different varieties of fruit is much needed. Will you assist in securing data on this important subject?

Please observe and record dates as follows :—The time of the opening of the first blossoms ; when the tree is in full bloom ; also, the date of the fall of the blossoms ; and forward your records to me at the close of the season.

In his Report for 1895, Mr. Craig gives some of the data obtained that year, and makes some useful comparisons of the time of blooming of different varieties.

It was thought desirable that five years' records should be obtained, so that a fair average of the relative dates of blooming of the different kinds of fruit could be had. Five years' records have now been taken, but the data accumulated are so great that it is impossible to publish it all in this Report ; hence, it has been found necessary to publish only what is thought to be of greatest value to the intending planter, namely, the relative time of blooming of the different varieties. As all the kinds of fruit of which the dates of blossoming have been recorded cannot be treated of this year, it has been thought advisable to publish only the conclusions reached regarding apples. If information is desired about other fruits before the results are published, or if more information is wanted about apples, it may be obtained by correspondence.

EARLY GROUP.

Antonovka, Duchess of Oldenburg, Early Harvest, Fameuse, Gravenstein, Gideon, Haas, Hurlbut, Longfield, Patten's Greening, Red Astrachan, Scott's Winter, Shiawassee Beauty. Tetofsky, Wagener, Scarlet Pippin.—16 varieties.

MEDIUM GROUP.

Alexander, Baldwin, Baxter, Ben Davis, Blenheim Orange, Canada Baldwin, Esopus Spitzenburg, Fallawater, Fall Jenetting, Gano, Golden Russet (American), Hubbardson's Nonsuch, Jonathan, Keswick Codlin, King of Tompkins Co., McIntosh Red, McMahan White, Magog Red Streak, Maiden's Blush, Malinda, Mann, Newtown Pippin, Peach, Pewaukee, Pomme Grise, Primate, Princess Louise, Rhode Island Greening, Roxbury Russet, St. Lawrence, Salome, Stark, Swaar, Swayzie Pomme Grise, Wealthy, Winter St. Lawrence, Wolf River, Yellow Transparent, Ontario, Ribston Pippin, Colvert, Brockville Beauty.—42 varieties.

LATE GROUP.

Blue Pearmain, Cranberry Pippin, Grimes' Golden, Lawver, Northern Spy, Red Canada, Talman Sweet, Walbridge, Westfield Seek no Further, Yellow Bellflower.—10 varieties.

The following is a list of those who have recorded the blossoming dates of fruits during the past five years:—

Recorders of blossoming periods.

1. Theodore Tragé, Salt Spring Island, B.C.
2. Thos. G. Earl, Lytton, B.C.
3. W. B. Anderson, Comox, B.C.
4. Richard Layritz, near Victoria, B.C.
5. Henry Kipp, Chilliwack, B.C.
6. Tom Wilson, Vernon, B.C.
6a. T. A. Sharpe, Agassiz, B.C.
7. C. E. F., Ottawa.
8. Geo. E. Fisher, Freeman, Ont.
9. A. W. Peart, Freeman, Ont.
10. Richard Trotter, Owen Sound, Ont.
11. Thos. Beall, Lindsay, Ont.
12. E. B. Edwards, Peterborough, Ont.
13. G. Nicol, Cataraqui, Ont.
14. W. H. Pettit, Grimsby, Ont.
15. J. P. Cockburn, Gravenhurst, Ont.
16. E. Morden, Niagara South, Ont.
17. B. Gott, Strathroy, Ont.
18. G. C. Caston, Craighurst, Ont.
19. N. J. Clinton, Windsor, Ont.
20. Allen Bros., Winona, Ont.
21. Capt. Jas. Shepherd, Queenston, Ont.
22. Robt. Brodie, St. Henri de Montreal, Que.
23. Hon. S. Fisher, Knowlton, Que.
24. J. C. Chapais, St. Denis, Qe.
25. C. P. Newmann, Lachine Locks, Que.
26. Mrs. S. Foster, Knowlton, Que.
27. J. M. Fisk, Abbotsford, Que.
28. W. M. Pattison, Clarenceville, Que.
29. Asa Johnston, East Farnham, Que.
30. W. Hawker, St. John, N.B.
31. G. U. Hay, St. John, N.B.
32. A. H. Fairweather, Hampton, N.B.
33. W. W. Hubbard, Sussex, N.B.
34. C. E. Brown, Yarmouth, N.S.
35. W. S. Blair, Nappan, N.S.
36. T. M. Ryerson, Carleton, N.S.
37. W. C. Archibald, Wolfville, N.S.
38. R. W. Starr, Wolfville, N.S.
39. Geo. Thompson, Wolfville, N.S.
40. Rev. H. How, Annapolis, N.S.
41. S. C. Parker, Berwick, N S.
42. D. J. Stewart, Aitkens' Ferry, P.E.I.
43. John Robertson, New Perth, P.E I.
44. Hon. David Laird, Charlottetown, P.E.I.
45. T. J. Weeks, Alberton, P.E.I.
46. F. W. McRae, Pownal, P.E.I.
47. J. Johnstone, Long River, P.E.I.
48. Wm. Heard, Charlottetown, P.E.I.

LIST OF BEST VEGETABLES FOR FARMERS.

As all the experiments which are conducted with vegetables cannot be published every year on account of want of space; a list of the varieties of all the principal kinds which have proved the most satisfactory after several years tests was published in the report for 1898 under the heading "List of best Vegetables for Farmers." This gave in a concise form much valuable information as to the best varieties to plant and must have proved very helpful to those who studied it. As the annual reports are very liable to be mislaid during the year, and as one is apt to forget the name of a variety, it has been thought advisable to again publish this list with what changes another year's experience warrants making.

Asparagus.—Connover's Colossal is the best all round variety.

Beans.—Golden Wax or Wardwell's Kidney Wax, for early crop; Early Refugee, for medium; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Southern Crease-back and Asparagus, (early) and Golden Andalusia, (late), are the best pole varieties.

Beets.—Egytian Turnip, Eclipse, and Bastian's Blood Turnip are three of the best varieties.

Borecole or Kale.—Dwarf Green Curled Scotch is the best.

Broccoli.—White Cape.

Brussels Sprouts.—Improved Dwarf is the most satisfactory.

Cabbage.—Early Jersey Wakefield (early), Succession (medium); Late Flat Dutch, Drumhead Savoy, (late), Red Dutch, (red), is a select list of the best varieties of cabbage.

Cauliflowers.—Extra Early Dwarf Erfurt and Early Snowball, (early); Kronk's Perfection, (medium) and Large Late Algiers are among the best.

Carrots.—Chantenay and Guerande or Oxheart are two of the best carrots, but if a good extra early sort is required the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching, Paris Golden Yellow, Improved White Plume, White Walnut (early); London Red, Perfection Heartwell, White Triumph, (late), are among the best.

Corn.—Early White Cory, Crosby's Early, Henderson's Metropolitan, (early); Perry's Hybrid, Stabler's Early, Early Evergreen (medium); Stowell's Evergreen, Country Gentleman (late.) In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably, and is of fine quality.

Cucumbers.—Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling is a good pickling sort.

Egg Plants.—New York Improved and Long Purple succeed best.

Lettuce.—Black Seeded Simpson, New York, (curled), Tennis Ball, Salamander, and Golden Queen, (cabbage); Trianon and Paris White Cos lettuce make a good list.

Melons, Musk.—Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type, and Surprise, Bayview, Paul Rose and Christiana, of the other types, are all good.

Melons, Water.—Cole's Early, New Imperial, Ice Cream, and Phinney's Early, are early water melons of excellent quality.

Onions.—Yellow Globe Danvers, and Large Red Wethersfield, are two of the best onions in cultivation.

Parsnips.—Hollow Crown and Dobbie's Selected are both good sorts.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Cardinal, Squash, and Golden Dawn are four of the best.

Pease.—Gregory's Surprise, Gradus, Nott's Excelsior and American Wonder, (early); Heroine, Improved Stratagem, and McLean's Advancer, (medium). None of these are tall growing varieties. Juno (dwarf), Telephone, Veitch's Perfection (tall), (late).

Potatoes.—Extra Early: Early Ohio (pink), Earliest of all, Bovee and Burpee's Extra Early (pink and white). Early: Everett and Rochester Rose, (pink), Early Puritan, (white). Medium: Carman No. 1, (white), Empire State, (white). Late: Late Puritan (white), American Wonder (white), Rural Blush (pink).

Radishes.—Early: Rosy Gem, French Breakfast, Red Rocket. Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Linnæus and Victoria are the most satisfactory.

Salsify.—Long White is the best.

Spinach.—Victoria and Thick-leaved are the best.

Squash.—Early: White Bush Scalloped and Summer Crook Neck. Late: Hubbard.

Tomatoes.—Early: Conqueror, Dwarf Champion, Canada Victor and Early Ruby. Main crop: Brinton's Best, Livingston's Favorite, Matchless, and Baltimore Prize Taker.

There are many varieties of this vegetable which are almost equal in excellence and productiveness.

Turnips.—Early: Extra Early Milan and Red Top Strap Leaf. Swedes: Champion Purple Top, Skirvings Improved.

EXPERIMENTS WITH POTATOES.

The yields from the 143 varieties of potatoes grown for comparison in uniform test plots were very good this year, the best yielding variety, American Wonder, producing at the rate of 640 bush. 12 pounds per acre; while the poorest gave 204 bush. 36 pounds per acre. The average yield per acre from the 143 varieties was 410 bush. 47 pounds, which is 291 bush. 47 pounds more than the average for Ontario this year, the average for Ontario being 119 bush. Had these varieties been grown in acre plots, the yields would not have been so large, but considering the fact that the poorest variety of the 143 tested, yielded 85 bush. 36 pounds more than the average for Ontario, it seems remarkable that larger crops are not produced throughout the country. The soil in which the potatoes were grown was a sandy loam, and, while in a good state of cultivation, it was not what would be called rich, although it was given a good dressing of barnyard manure in the spring of 1898. A crop of tobacco was taken off the same land in 1898. The soil was ploughed in the autumn of 1898, and again in the spring of 1899, when it was also disc harrowed and harrowed twice with the smoothing harrow before planting. The drills were made about 6 inches deep and 2½ feet apart, and the sets, which had at least three eyes, were of good size and were dropped 1 foot apart, each variety occupying one row 66 feet long. The potatoes were covered with the hand hoe to insure the most uniform conditions. The potatoes were cultivated when required throughout the summer, but were not hilled up. They were sprayed with Paris green and Bordeaux mixture to destroy the potato beetle and prevent blight. The potatoes were planted on May 22, and 23, and were dug on October 5, 6 and 7. There was no scab or rot this year.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
American Wonder	Good	640	12	587	24	52	48	White.
Holborn Abundance	Medium	609	24	530	12	79	12	"
Sabean's Elephant	Good	600	36	567	36	33	..	"
Everett	"	574	12	512	36	61	36	Pink.
Canadian Beauty	"	572	..	481	48	90	12	Pink and white.
Gem of Aroostook	"	567	36	479	36	88	..	"
Carman No. 1	"	541	12	484	..	57	12	White.
Maggie Murphy	Medium	541	12	517	..	24	12	Bright pink.
White Beauty	Good	534	36	444	24	90	12	White.
Hale's Champion	Poor	532	24	455	24	77	..	"
Vanier	"	530	12	479	36	50	36	Red.
Seattle	"	528	..	446	36	81	24	White.
New Queen	Good	521	24	433	24	88	..	Pink and white.
Prolific Rose	....	517	..	424	36	92	24	Pink.
Peachblow	....	514	48	424	36	90	12	White.
Wonder of the World	Good	514	48	433	24	81	24	Pink and white.
Swiss Snowflake	"	506	..	433	24	72	36	White.
Lizzie's Pride	"	506	..	453	12	52	48	Pink, red eye.
Rose of the North	....	501	36	444	24	57	12	Pink.
Empire State	Good	500	30	454	18	46	12	White.
Beauty of Hebron	Medium	500	24	449	48	50	36	Pink and white.
Mill's Prize	....	499	24	470	48	28	36	White.
White Elephant	....	499	24	413	36	85	48	Pink and white.
Seedling No. 230	Medium	495	..	468	36	26	24	White.
Early Sunrise	Good	492	48	409	12	83	36	Pink.
Champion	....	490	36	413	36	77	..	White.
Vigorosa	....	490	36	435	36	55	..	Pink and white.
State of Maine	Good	488	24	418	..	70	24	White.
Early Rose	"	484	..	385	..	99	..	Pink.
Ideal	....	481	48	431	12	50	36	"
Lightning Express	....	479	36	418	..	61	36	Pale pink, bright pink in eyes.
Early St. George	....	479	36	411	24	68	12	Pink and white.

POTATOES—TEST OF VARIETIES—*Continued.*

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Early White Prize	Good	475	12	400	24	74	48	White.
Brown's Rot Proof	Medium	473	..	396	..	77	..	Pink.
Monroe County	"	473	..	400	24	72	36	"
Rawdon Rose	Good	471	54	419	6	52	48	Pink and white.
Burnaby Seedling	"	468	36	433	24	35	12	"
Polaris	"	464	12	409	12	55	..	White.
Early Andes		464	12	407	..	57	12	Pink.
Chicago Market	Good	459	48	385	..	74	48	"
Early Dawn		457	36	409	12	48	24	Pink, brighter at seed end.
Vick's Extra Early	Good	457	36	376	12	81	24	Pink and white.
Burbank's Seedling		455	24	409	12	46	12	White.
Earliest of All	Good	455	24	369	36	85	48	Pink and white.
Seedling No. 7	Medium	453	12	426	48	26	24	Bright pink.
Penn. Manor		453	12	398	12	55	..	Pink and white.
Good News	Good	453	12	413	36	39	36	Pink.
American Giant	Medium	453	12	426	48	26	24	White.
Early Norther	"	453	12	387	12	66	..	Pink.
Columbus		451	..	400	24	50	36	Pink and white.
Ohio Junior		451	..	415	48	35	12	Pink.
Northern Spy	Poor	448	48	424	36	24	12	Bright pink.
Sir Walter Raleigh		448	48	407	..	41	48	White.
Burnaby Mammoth		448	48	400	24	48	24	Pink and white.
Thorburn	Good	448	48	352	..	96	48	"
Great Divide	"	442	12	349	48	92	24	White.
Sharpe's Seedling	"	441	6	409	12	31	54	Pink and white.
Satisfaction	"	440	..	396	..	44	..	White.
Early Harvest	"	437	48	393	48	44	..	Pink.
Peerless Junior	"	437	48	391	36	46	12	White.
Orphans	Medium	437	48	413	36	24	12	"
Honeoye Rose	Good	437	48	363	..	74	48	Pink.
General Gordon	"	433	24	380	36	52	48	"
Burpee's Extra Early	"	431	12	374	..	57	12	Pink and white.
King of the Roses		431	12	323	24	107	48	"
Rochester Rose	Good	431	12	360	48	70	24	Pink.
Jubilee		429	..	380	36	48	24	Pink and white.
Clay Rose	Poor	429	..	365	12	63	48	Pink.
Hopeful	Medium	426	48	347	36	79	12	White.
Early Ohio	Good	426	48	301	24	125	24	Pink.
Light Red Seedling		426	48	334	24	92	24	Pink.
Dreer's Standard	Good	424	36	382	48	41	48	White.
Maule's Thoroughbred		422	24	347	36	74	48	Pink.
Pride of the Table	Poor	418	..	310	12	107	48	"
Green Mountain	Good	418	..	367	24	50	36	White.
Dakota Red	Medium	415	48	312	24	103	24	Red.
Uncle Sam		411	24	356	24	55	..	White.
Delaware	Good	411	24	338	48	72	36	"
London	Medium	409	12	332	12	77	..	Pink.
Rose of Erin		409	12	363	..	46	12	Pale pink, bright pink eye.
Stourbridge Glory	Good	409	12	343	12	66	..	White.
Rural Blush	"	409	12	272	48	136	24	Pink.
Prize Taker	"	407	..	360	48	46	12	"
I. X. L.	"	404	48	334	24	70	24	Pink and white.
Reeves' Rose		404	48	334	24	70	24	Pink.
Bliss Triumph		402	36	330	..	72	36	Red.
Freeman	Good	400	24	308	..	92	24	White.
New Variety No. 1	Poor	396	..	360	48	35	12	White.
Troy Seedling	Medium	396	..	301	24	94	36	"
Napoleon	Good	396	..	277	12	118	48	Pink.
Crown Jewel	"	393	48	281	36	112	12	Pink and white.
Clarke's No. 1	"	391	36	314	36	77	..	Pink.
Rose No. 9	Medium	391	36	321	12	70	24	"
Flemish Beauty Seedling	Poor	391	36	316	48	74	48	Bright pink.

POTATOES—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Pearce's Extra Early	Good	389	24	330	..	59	24	Pink.
Money Maker	"	389	24	314	36	74	48	White.
Late Puritan	"	389	24	323	24	66	..	"
Rural No. 2	"	387	12	345	24	41	48	"
Bovee	"	385	..	288	12	96	48	Pink and white.
Early Gem	Medium	382	48	332	12	50	36	Pink.
Irish Cobbler		382	48	279	24	103	24	White.
Carman No. 3	Good	380	36	352	..	28	36	"
Pearce's Prize Winner	"	377	18	297	..	80	18	Pink.
Early Puritan	"	369	36	332	12	37	24	White.
Blue Cup	"	367	24	305	48	61	36	Blue and white.
Daisy	"	365	12	268	24	96	48	Pink and white.
White Giant		363	..	310	12	52	48	White.
McKenzie	Good	358	36	303	36	55	..	"
Cambridge Russet	"	358	36	312	24	46	12	"
World's Fair	"	343	12	294	48	48	24	"
Early Fortune		336	36	244	12	92	24	Pink.
Irish Daisy	Good	334	24	228	48	105	36	White.
Doherty's Seedling		332	12	299	12	33	..	"
Livingston		332	12	292	36	39	36	White, pink eye.
Early Pride		330	..	242	..	88	..	Pink.
Early Six Weeks	Good	327	48	277	12	50	36	"
Charles Downing	"	327	48	261	48	66	..	White.
Enormous		323	24	261	48	61	36	"
Harbinger	Good	319	..	231	..	88	..	Pale pink.
Reading Giant	Poor	316	48	180	24	136	24	Pink.
Lee's Favourite	Good	316	48	253	..	63	48	"
Country Gentleman		314	36	270	36	44	..	Pink and white.
Bill Nye		310	12	235	24	74	48	White.
Table King	Poor	292	36	242	..	50	36	"
Oregon Beauty	Medium	292	36	242	..	50	36	"
Queen of the Valley	"	290	24	259	36	30	48	Bright pink.
Pink Eye		286	..	235	24	50	36	
Quaker City		283	48	231	..	52	48	White.
Algoma No. 1	Good	283	48	226	36	57	12	Pink.
Harvest King		266	12	253	..	13	12	White.
Sutton's Abundance	Good	266	12	231	..	35	12	"
Seneca Queen	Very good	261	48	193	36	68	12	Pink and white, bright pink eye.
Victor Rose	Medium	259	36	187	..	72	36	Pink.
Fillbasket		246	24	195	48	50	36	Bright pink.
20th Century		235	24	176	..	59	24	White.
Pride of the Market	Good	235	24	187	..	48	24	"
Early Market		224	24	158	24	66	..	Pink, brighter at seed end.
Brownell's Winner	Good	220	..	187	..	33	..	Red.
Livingston's Banner	"	211	12	189	12	22	..	White.
Seedling No. 214	"	209	..	149	36	59	24	"
Dark Red Seedling		206	48	154	..	52	48	Deep pink.
Houlton Rose		204	36	173	48	30	48	Pink.
Egg		204	36	118	48	85	48	White.

For many years, experimenters, both in Europe and America, have given the potato much attention, but the results obtained by them have, in many cases, been very different. Varieties of potatoes differ so much in their season, habit of growth, manner of producing their crop, number and vigour of the eyes on the tubers, and other characteristics, that one variety may give one result if the sets are cut or planted in a certain way, while another may give another result. However, there are certain general principles which have been established by the work which has been done.

The following experiments include some of the most popular of those tried by experimenters, and while the results obtained are by no means conclusive, they may lead others to try experiments with their own varieties.

Potatoes—Planting at Different Distances Apart.

During the past four years an experiment has been tried in planting the sets at different distances apart in the rows; the rows in each case being 2½ feet apart. The best results have been obtained so far by planting the sets 12 inches apart, although it will require several years before accurate conclusions can be drawn. There was very little difference in the proportion of marketable and unmarketable tubers in this experiment.

Distance apart of Sets.	Seed required per acre.		Yield per acre, 1896.		Yield per acre, 1897.		Yield per acre, 1898.		Yield per acre, 1899.		Average yield per acre, 4 years.		Average yield per acre after deducting seed.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
10 inches apart	34	50	355	18	331		268	24	392	2	336	41	301	51
12 "	29	2	336	36	278	47	347	36	406	34	342	23	313	21
14 "	24	53	323	24	268	50	290	24	454	58	334	24	309	31
16 "	21	46	335	30	226	1	233	12	392	3	296	41	274	55
18 "	19	21	289	18	226	31	253		234	34	250	51	231	30

Potatoes—Planting at Different Depths.

An experiment has been conducted during the past two years in planting potatoes at different depths in rows 2½ feet apart and 12 inches apart in the rows. Each set had at least three eyes. The soil was sandy loam, both years. Level cultivation was adopted, and thus very little soil was thrown on the potatoes after they were covered at the time of planting. The following table shows that the best yields were obtained from planting the sets only 1 inch deep. As the relative yields from the different depths of planting have not been the same in both years, it will be necessary to continue this test for some time before accurate conclusions can be drawn. Notes were taken on the depths at which tubers were formed, and it was found that most of them were within 4 inches of the surface of the soil, even where the set had been planted 6, 7 and 8 inches deep. Where the sets were planted less than 4 inches deep nearly all the tubers were formed between that and the surface of the soil.

Depth of Planting.	Yield per acre, 1898.		Yield per acre, 1899.		Average yield per acre, 1898-9.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1 inch	347	36	532	24	440	
2 "	244	12	469	28	306	50
3 "	281	36	493	41	387	38
4 "	277	12	520	18	398	45
5 "	290	24	474	19	382	21
6 "	264		421	5	342	32
7 "	290	24	392	3	341	13
8 "	266	12	353	19	309	45

POTATOES—PLANTING AT DIFFERENT DATES.

In 1898 an experiment was begun in planting potatoes at different dates, beginning when the main crop was put in and continuing at intervals of two weeks until August 23, 1898 and July 23, 1899. An early and a late variety were used in each case. Early Norther (early) and Irish Daisy (late) in 1898, and Early Norther and Rural Blush in 1899. It will be seen that there was a regular decrease in the yield from each planting.

Date of Planting.	Total Yield per Acre, 1898.		Yield per Acre Marketable, 1898.		Yield per Acre Unmarketable, 1898.		Total Yield per Acre, 1899.		Yield per Acre Marketable, 1899.		Yield per Acre Unmarketable, 1899.		Total Average Yield per Acre, 1898-9.		Average Yield per Acre, Marketable, 1898-9.		Average Yield per Acre, Unmarketable, 1898-9.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Early Variety.																		
1st planting, May 26, 1898; May 26, 1899...	277	12	215	36	61	36	505	47	445	17	60	30	391	29	330	26	61	3
2nd planting, June 10, 1898; June 9, 1899....	160	36	105	36	55	..	459	48	401	43	58	5	310	12	253	39	56	33
3rd planting, June 24, 1898; June 23, 1899...	125	24	74	48	50	36	237	10	203	17	33	53	181	17	139	2	42	15
4th planting, July 8, 1898; July 7, 1899....	30	48	....		30	48	9	41	....		9	41	20	14	....		20	14
5th planting, July 23, 1898; July 21, 1899...	1	6	....		1	6	....		....		....		....		....		..	33
6th planting, Aug. 9, 1898	....		....		....		....		....		....		....		....		....	
7th " " 23, 1898	....		....		....		....		....		....		....		....		....	
Late Variety.																		
1st planting, May 27, 1898; May 26, 1899...	259	36	158	24	101	12	338	48	300	5	38	43	299	12	229	14	69	58
2nd planting, June 10, 1898; June 9, 1899....	173	48	127	36	46	12	164	34	82	17	82	17	169	11	104	56	64	15
3rd planting, June 24, 1898; June 23, 1899...	68	12	....		....		157	18	128	16	29	2	112	45	....		....	
4th planting, July 8, 1898; July 7, 1899..........	8	48	....		8	48	19	22	....		19	22	14	5	....		14	5
5th planting, July 23, 1898; July 21, 1899...	1	6	....		1	6	....		....		....		....		....		....	33
6th planting, Aug. 9, 1898	....		....		....		....		....		....		....		....		....	
7th " " 23, 1898	....		....		....		....		....		....		....		....		....	

NOTE.—The yield from the third planting in 1898 was not divided into marketable and unmarketable, hence an average cannot be made of them for that planting.

EXPERIMENTS WITH TOMATOES.

This year 144 varieties were grown for comparison. As lack of space would not permit of a table being published of all the varieties tested, only twenty-five of the best yielding sorts, with data regarding the yields from early and late pickings, are given. In addition to these, are tables in which may be found the names of the six wrinkled varieties which have given the best average yields of ripe fruit during the past four years, and also twelve of the best yielding smooth varieties for the same time.

The seeds were sown this year in hot beds on March 29; the young plants pricked out into strawberry boxes on April 28, and planted in the open ground on June 6, 4 feet apart each way, five plants of each variety being used. The soil was a light sandy loam, which had not received any fertilizers since 1897. The plants grew well, not one having to be replaced. The soil was kept cultivated with the horse cultivator and hoed until the plants became too large to permit of further hoeing.

The season was unfavourable for ripening a heavy crop of tomatoes, and the yields were much less than last year.

TWENTY-FIVE BEST YIELDING VARIETIES OF TOMATOES, 1899.

Variety.	Seedsman.	Date of First Ripe Fruit.		Yield of Ripe Fruit. — First three pickings		Yield of Ripe Fruit. — Last three pickings		Total Yield of Ripe Fruit. — All pickings		Remarks.
				Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	
Dominion Day	Bruce	Aug.	4	1	9	79	12	98	11	Above medium size, moderately regular, wrinkled, scarlet.
Bright and Early	Dreer	"	4	5	5	69	..	89	12	Below medium size, regular, smooth, scarlet.
Early Bermuda	Landreth	"	4	4	11	74	4	89	11	Medium size, regular, wrinkled, scarlet.
Money Maker	"	"	3	1	14	50	8	82	2	" "
Alpha	Gregory	"	3	7	1	43	4	80	9	Medium size, regular, smooth, scarlet.
Bond's Early Minnesota	"	July	28	5	3	51	12	70	12	Medium size, regular, smooth, purple.
Canada Victor	Graham	"	31	7	2	30	..	66	14	Medium size, regular, smooth, scarlet.
Early Bird	Johnson & Stoke.	Aug.	3	4	2	54	8	66	12	Medium size, regular, smooth, purple.
Comrade	Gregory	"	1	3	3	52	4	65	12	Medium size, regular, smooth, scarlet.
Conqueror	Steele	July	28	6	3	41	4	64	11	Medium size, moderately regular, wrinkled, scarlet.
Faultless Early	Farquhar	"	29	4	4	45	8	64	8	Below medium size, regular, smooth, scarlet.
Essex Early Market	"	Aug.	2	5	10	47	..	64	3	Medium size, regular, smooth, purple.
Earliest of All	Steele	July	29	7	8	40	4	62	13	Medium size, moderately regular, almost smooth, scarlet.
Maule's Earliest	Maule	"	28	5	..	36	..	62	12	Above medium size, irregular, wrinkled, scarlet.
Atlantic Prize	Steele	"	26	6	10	33	4	60	14	Medium size, regular, smooth, scarlet.
Best of All Forcing	Graham	"	26	3	13	49	8	60	7	Above medium size, regular, smooth, scarlet.
Creekside Glory	Simmers	Aug.	4	..	10	54	4	59	15	Above medium size, moderately regular, smooth, scarlet.
Early Richmond	Landreth	July	31	3	8	47	12	59	1	Medium size, irregular, wrinkled, scarlet.
Early Ruby	Steele	Aug.	2	7	15	30	4	58	2	Medium size, regular, smooth, scarlet.
Extra Early Jersey	Landreth	July	31	3	14	41	4	56	13	Medium size, regular, wrinkled, scarlet.
Essex Hybrid	Henderson	Aug.	2	5	1	41	8	56	2	Medium size, regular, smooth, purple.
Freedom	"	July	30	3	13	43	8	56	1	Medium size, regular, smooth, scarlet.
Democrat	Thorburn	Aug.	7	1	9	39	8	54	3	Large, irregular, smooth, purple.
Livingston's Perfection	Graham	"	4	3	2	42	..	54	2	Large, regular, smooth, scarlet.
Trophy	"	"	4	..	5	47	12	53	..	" "

SIX BEST YIELDING WRINKLED VARIETIES—AVERAGE FOR FOUR YEARS.

Name.	Average date of First Ripe Fruit.	Average Yield per Plant. Lbs.	Ozs.	Remarks.
Early Bermuda	Aug. 5	17	13	Medium size, regular, wrinkled, scarlet.
Money Maker	" 1	16	15	" "
Early Richmond	" 3	16		Medium size, irregular, wrinkled, scarlet.
Extra Early Jersey	" 1	16		Medium size, regular, wrinkled, scarlet.
Conqueror	July 30	15	11	Medium size, moderately regular, wrinkled, scarlet.
Democrat	Aug. 3	15	3	Large, irregular, smooth, purple.

TWELVE BEST YIELDING SMOOTH VARIETIES—AVERAGE FOR FOUR YEARS.

Name.	Average date of First Ripe Fruit.	Lbs.	Ozs.	Remarks.
Canada Victor	July 31	15	14	Medium size, regular, smooth, scarlet.
Comrade	Aug. 3	15	10	" "
Brinton's Best	" 10	15	7	Large, regular, smooth, scarlet.
Extra Early Advance	" 2	15	4	Below medium size, regular, smooth, scarlet.
Early Ruby	July 31	14	15	Medium size, regular, smooth, scarlet.
Baltimore Prize Taker	Aug. 5	14	14	Medium size, regular, smooth, purple.
Atlantic Prize	" 3	14	10	Medium size, regular, smooth, scarlet.
Bond's Early Minnesota	July 30	14	7	Medium size, regular, smooth, purple.
Horsford's Prelude	Aug. 2	14	7	Small, regular, smooth, scarlet.
Mayflower	" 3	14	5	Large, regular, smooth, scarlet.
Essex Hybrid	" 2	14		Medium size, regular, smooth, purple.
Livingston's Favourite	" 11	13	8	Large, regular, smooth, scarlet.

Of the twelve best smooth varieties, Brinton's Best, Baltimore Prize Taker and Livingston's Favourite are the best for a main crop, but others have the advantage of earliness and should be planted where early tomatoes are desired.

CELERY—TEST OF VARIETIES.

Experiments were conducted this year with forty varieties of celery, nearly all of which were grown in duplicate. The soil was a good sandy loam which retained the moisture very well throughout the season. The land was prepared by ploughing it about 8 inches deep and then harrowing it into good tilth with a smoothing harrow. Drills were made with a drill plough from 10 to 12 inches deep, and 4 feet apart. Well rotted barn-yard manure was then put in the drills to a depth of about 3 inches and thoroughly incorporated with the soil by means of a digging fork. The soil was now ready for the plants. The celery seed was sown in hot-beds on April 5, and the young plants transplanted to a cold frame on May 26. They were planted out 8 inches apart in the drills, which were now almost level with the rest of the ground, on July 12. The soil was hoed on August 15, and on the 30th the soil was cultivated and the plants packed by hand and hilled up with the hoe. The soil was again cultivated on September 16, and the plants packed by hand and finally hilled up with the spade. During the growing season the foliage was kept covered with Bordeaux mixture, and there was very little disease, although other celery in the neighbourhood of Ottawa suffered. The celery was dug on October 20.

The blanching of early varieties by means of boards gives very satisfactory results, and this method is being more generally adopted by growers. The later kinds are kept best while bleaching, and before being sold, by standing the plants close together in a cool, dark place on moist sand, or by burying the roots in the sand. To have it keep well, the tops should be kept dry and the roots moist.

In the following table a list is given of the varieties which have been tested during the past two years, with notes on their yields, season and quality :—

Name of Variety.	Seedsman.	Yield from 24 plants, 1898.	Yield from 30 plants, 1899.	Yield from 30 plants. 1899.	Total yield from 104 plants. 1898-9.	Remarks.
	1899.	Lbs.	Lbs.	Lbs.	Lbs.	
Perfection Heartwell.....	Bruce	42½	57	43	142½	Late ; very good quality.
Simmers' Imperial	Simmers. .	17½	60	53	130½	Late ; medium quality.
Seymour's White Giant ...	" .	24½	54	50	129	" "
Pascal White Solid..	Bruce	40½	39	46½	126	Late ; good quality.
Large Ribbed Kalamazoo..	Thorburn.	35½	32	45	112½	Late ; above medium quality.
Crawford's Half Dwarf....	Rennie ...	25½	27½	57	110	Late ; medium quality.
Triumph..	Evans....	21	41	45½	107½	Late ; above medium quality.
Simmers' Special Dwarf, White Winter	Simmers. .	22¾	32	51½	106¼	Late ; below medium in quality.
Prize London Red	Steele	19½	33½	51½	104½	Late ; good quality.
Giant Pascal	Simmers. .	26	30	47½	103½	Late ; medium quality.
Improved White Plume...	Thorburn.	20¼	46	36	102¼	Early ; good quality.
Cooper's Improved Cutting	Landreth.	35½	13½	52	101	Late ; poor quality.
Red Ribbed Self Blanching	Thorburn.	22	39¼	37	98¼	Early ; good quality.
Dobbie's Invincible White.	Ewing . . .	27	26	45	98	Late ; above medium quality.
Large Ribbed Dwarf White	Simmers. .	16	31½	46½	94	Late ; medium quality.
New Rose	" .	13¾	28	51	92¾	" "
Paris Golden Yellow.....	Bruce	24½	25½	36½	86½	Early ; good quality.
Hamilton Red............	"	17	27	39	83	Late ; medium quality.
Sandringham Dwarf White Solid.	Simmers. .	18¼	22½	37½	78¼	" "
Pink Plume........	" .	12¼	31	34	77¼	Early ; good quality.
Golden Self Blanching.....	" .	22¾	21½	32½	76¾	" "
Golden Rose	Henders'n	17½	23	25½	66	" "

In addition to the foregoing the following varieties were tested in 1899 :—

Name of Variety.	Seedsman.	Yield from 30 plants, 1899.	Yield from 30 plants, duplicate, 1899.	Total yield from 60 plants, 1899.	Remarks.
		Lbs.	Lbs.	Lbs.	
Kalamazoo	Pearce......	62	53	115	Late ; medium quality.
Giant White Solid..........	Henderson. .	50	61½	111½	Late ; poor quality.
Rennie's Giant White.	Rennie.	47	57½	104½	Late ; below medium in quality.
New Winter Queen	Johnston & Stoke.....	57	46½	103½	Late ; medium quality.
Large White Solid..........	Rennie......	46	47	93½	
Perle le Grande......	Thorburn...	37	53	90	" "
Golden Dwarf	Henderson. .	32½	52½	85	" "
Dobbie's Selected Red.......	Ewing	31	47½	78½	
Large Ribbed Red	Bruce	39½	39	78½	" "
Henderson's Half Dwarf.....	Henderson. .	33	45	78	" "
Golden Heartwell...	Simmers....	34½	43	77½	" "
Shumacher	Thorburn...	35	40½	75½	" "
Rose Ribbed Golden Self Blanching................	Simmers....	31	42	73	Early ; good quality.
Major Clark's Solid.........	Bruce	27	43½	70½	Late ; good quality.
White Walnut.	Rennie.	36½	31½	68	Early ; very good quality.
Thorburn Fin de Siecle......	Thorburn . .	27½	46	67½	Late ; above medium quality.
White Plume....	Simmers....	27½	34	61½	Early ; good quality.

EXPERIMENTS WITH CORN.

During the past two years a large number of varieties of sweet corn have been tested, in order to determine their relative standing as regards time of being ready for use, quality, size of ear, yield and height of plant, and in the following table particulars will be found regarding these points. In 1898, thirty-six varieties were tested, and in 1899, seventy-six varieties. The soil in which the corn was grown in 1899 was sandy loam. Clover was ploughed under in the spring, the land disc-harrowed and harrowed twice with the smoothing harrow. The corn was planted on May 30 in hills three feet apart each way, about six kernels being planted in each hill. After the seed had germinated and there was no longer danger from cut worms, the number of plants in a hill was reduced to four. Twelve hills of each variety were used for comparison. The corn was kept thoroughly cultivated during the summer, and when growth had ceased in the autumn it was cut and the ears removed and counted.

EARLY VARIETIES.

Name.	Seedsman.	Kind.	Fit for use, 1898.	Fit for use, 1899.	Height, 1899.		Length of ears, 1898.	Length of ears, 1899.	Average length of ears for two years.	Marketable ears from 12 hills, 1898.	Marketable ears from 12 hills, 1899.
					ft.	in.	in.	in.	in.		
Extra Early Beverly	Landreth	Hybrid	....	Aug. 12	5	4	....	7	...	....	31
Extra Early Cory	Steele	Sweet	Aug. 7	" 15	6	0	7	6½	6¾	43	60
Mitchell's Extra Early	Pearce	Flint	....	" 15	6	3	....	8	....	...	59
Early Marblehead	Steele	Sweet	Aug. 8	" 15	6	4	7	7	7	38	52
Telephone Sweet	Salzer	"	....	" 15	5	6	....	6	....	....	49
Early Cory	Bruce	"	......	" 15	6	0	....	7	....	....	42
Mammoth White Cory	Gregory	"	Aug. 7	" 15	4	6	6	5	5½	25	35
Burbank's Early Maine	J. & Stoke	"	....	" 16	6	0	...	6	....	....	59
Early La Crosse	Salzer	"	....	" 16	6	4	....	7	...	....	51
Lackey's Early Sweet	Gregory	"	....	" 17	5	6	....	7	....	...	56
Early Fordhook	Burpee	"	....	" 17	5	6	....	6	....	....	52
Quincy Market	Gregory	"	....	" 17	6	4	....	6½	....	...	51
Ford's Early	Ewing	"	Aug. 8	" 17	5	8	7	7	7	40	49
First of All	Salzer	"	....	" 17	5	0	....	6	....	....	34
Early Landreth Market	Landreth	"	....	" 18	7	6	....	7	....	....	38
Burpee's Earliest Sheffield	Burpee	Hybrid	....	" 19	7	2	....	6	....	....	57
Adam's Extra Early	Rennie	Flint	....	" 19	6	9	....	7	....	...	42
First of All	Pearce	Sweet	....	" 19	5	7	....	7½	...	...	66
Henderson's Metropolitan	Henderson	"	Aug. 12	" 19	6	4	8	7½	7¾	43	48
White Cory	Thorburn	"	" 7	" 21	7	3	7	7	7	35	49

SECOND EARLY VARIETIES.

Name.	Seedsman.	Kind.	Fit for use, 1898.	Fit for use, 1899.	Height, 1899, ft.	Height, 1899, in.	Length of ears, 1898.	Length of ears, 1899.	Average length of ears for two years.	Marketable ears from 12 hills, 1898.	Marketable ears from 12 hills, 1899.
Kendall's Early Giant	Pearce	Sweet	Aug. 12	Aug. 21	6	6	6	7½	6¾	31	43
Maule's XX Sugar	Maule	"	....	" 22	6	6	....	8	...	....	42
Champion Sweet	Pearce	"	.....	" 22	6	0	....	7	....	....	28
Harvey's Early	Vick	"	....	" 23	7	5	....	7½	...	...	51
New Early Dawn	J. & Stoke	"	....	" 23	7	0	....	8	....	....	50
Crosby's Extra Early	Steele	"	Aug. 12	" 23	6	1	7	6	....	38	50
Early Minnesota	"	"	" 8	" 23	6	0	7½	7	7¼	58	31
Early Market	Rennie	"	" 8	" 24	6	6	8	7	7½	55	59
Early Giant Sweet	Steele	"	" 12	" 24	6	4	7	7½	7¼	25	52
Low's Perfection	Rennie	"	....	" 25	8	6	....	7½	...	....	59
Child's Honey Dew	Childs	"	....	" 25	6	10	....	7	..	....	54
Melrose	Thorburn	"	....	" 25	6	6	....	7	...	....	46

SECOND EARLY VARIETIES—*Concluded.*

Name.	Seedsman.	Kind.	Fit for use, 1898.	Fit for use, 1899.	Height, 1899.	Length of ears, 1898.	Length of ears, 1899.	Average length of ears for two years.	Marketable ears from 12 hills, 1898.	Marketable ears from 12 hills, 1899.
					ft. in.	in.	in.			
Boston Market	Pearce	Sweet	....	Aug. 25	6 4	....	7	....	....	44
New Champion	Salzer	"	Aug. 12	" 25	6 9	8	7	7½	42	33
Pee & Kay	Pearce	"	....	" 26	6 10	....	7½	....	....	52
Shaker's Early	"	"	Aug. 20	" 26	7 0	7	8	7½	41	50

INTERMEDIATE VARIETIES.

Name.	Seedsman.	Kind.	Fit for use, 1898.	Fit for use, 1899.	Height, 1899.	Length of ears, 1898.	Length of ears, 1899.	Average length of ears for two years.	Marketable ears from 12 hills, 1898.	Marketable ears from 12 hills, 1899.
Black Mexican	Ewing	Sweet	Aug. 27	Aug. 28	6 9	8	7	7½	49	71
Burlington Hybrid	J. & Stoke	"	....	" 28	7 8	....	8	....	....	53
Stabler's Early	Henderson	"	Aug. 22	" 29	7 7	8	8	8	39	39
Nonsuch	Bruce	"	" 24	" 30	7 0	7	8	7½	32	30
Asylum Sweet	Thorburn	"	....	" 30	7 0	....	8	..	....	27
Tuscarora	Rennie	"	....	" 30	6 9	....	8½	....	..	21
Moore's Early Concord	Rennie	"	Aug. 22	" 31	7 6	8	8	8	32	44
Perry's Hybrid	Steele	"	" 19	" 31	6 6	9	7½	8¼	58	31
Russell's Prolific	Vick	"	....	" 31	8 2	....	9	....	..	27
Amber Cream Sugar	Burpee	"	....	" 31	7 8	...	8	....	....	22
Early Bonanza	J. & Stoke	"	....	Sept 1	6 4	....	7	....	...	39
New Early Evergreen	"	"	....	" 1	7 6	...	7	....	....	38
New Honey Sweet	"	"	Aug. 27	" 1	6 2	7	7	7	31	33
Roslyn Hybrid	Thorburn	"	....	" 1	8 3	....	8	....	....	38
Stabler's Nonpareil	Dreer	"	....	" 1	7 2	....	8	....	....	33
Landreth's Sugar	Landreth	"	....	" 1	7 3	....	6½	....	....	29
Early Mammoth Sugar	Bruce	"	....	" 1	6 8	....	9	....	..	27
Hickox Sugar	"	"	Aug. 30	" 1	7 2	9	7	8	46	26
Potter's Excelsior	Thorburn	"	....	" 1	6 4	...	6	....	....	18
The Henderson	Henderson	"	....	" 1	6 4	....	7	....	...	14
Guarantee Sweet	J. & Stoke	"	....	" 2	7 4	....	7½	....	....	59
Early Eight-rowed Sugar	Thorburn	"	....	" 2	7 0	....	8	....	....	39
Ziz-Zag Evergreen	Ewing	"	Sept. 5	" 2	7 5	7	7	7	29	35
Evergreen Sugar	"	"	....	" 2	8 3	....	8½	....	....	31
Old Colony	"	"	....	" 2	6 3	....	6	....	....	24
Squantum	Henderson	"	....	" 2	6 4	....	7½	....	....	29
Triumph Sugar	Thorburn	"	....	" 2	7 6	....	8	...	....	23

LATE VARIETIES.

Name.	Seedsman.	Kind.	Fit for use, 1898.	Fit for use, 1899.	Height, 1899.	Length of ears, 1898.	Length of ears, 1899.	Average length of ears for two years.	Marketable ears from 12 hills, 1898.	Marketable ears from 12 hills, 1899.
New Columbus	Vick	Sweet	....	Sept. 4	8 4	....	7	....	...	41
Columbus Market	Livingston	"	....	" 4	8 6	....	10	....	....	36
Bonanza Sweet	Gregory	"	....	" 4	8 0	....	7	....	...	35
Shoe Peg	Ewing	"	Sept. 10	" 4	6 6	6	6	6	38	30
Improved Ruby	Burpee	"	....	" 4	6 0	....	6	....	....	13
Extra Early Concord	Landreth	"	....	" 6	7 9	....	9	....	....	32
Red Cob Evergreen	Steele	Dent	Sept. 10	" 6	6 4	8	6	7	22	17
Egyptian Sweet	Rennie	Sweet	....	" 7	7 7	....	8	...	...	31
Ne Plus Ultra	"	"	....	" 11	7 6	....	8	....	....	24
Country Gentleman	Ewing	"	Sept. 10	" 12	6 6	7	7	7	39	44
Stowell's Evergreen	Pearce	"	" 3	" 12	7 0	9	7	8	29	16
Mammoth Sweet	"	"	" 1	" 12	6 10	10	6	8	28	14
Old Colony	Burpee	"	Aug. 31	" 14	7 0	8	6½	7¼	36	24

Of the varieties tested in 1899, the following were the most promising, given in the order in which they were ready for market :—

EARLY.—Extra Early Beverly (not a very sweet corn but the earliest yet tested), Extra Early Cory, Early Marblehead, Lackey's Early Sweet, Burpee's Earliest Sheffield (not a very sweet variety, but productive and with uniform ears), First of All (Pearce), Henderson's Metropolitan.

SECOND EARLY.—Crosby's Extra Early, Early Market, Early Giant Sweet, Low's Perfection, Child's Honey Dew, Boston Market.

INTERMEDIATE.—Black Mexican, Stabler's Early, Perry's Hybrid, New Early Evergreen, New Honey Sweet, Guarantee Sweet.

LATE.—Ne Plus Ultra, Country Gentleman.

TOBACCO.

This year forty-eight varieties of tobacco were grown for comparison as to time of ripening and productiveness ; notes were also taken on other characteristics regarding them. The seed was sown in a hot bed on April 4, the young plants transplanted into a cold frame on May 20, and planted in the field on June 15. The soil where the tobacco was grown was a light sandy loam, which received a dressing of well rotted barnyard manure at the rate of twenty tons per acre before it was ploughed in the spring of 1899. The soil was ploughed on June 7, disc harrowed once, and harrowed twice with the smoothing harrow before planting. The plants were set 3 by 3½ feet apart, the land being previously marked with a corn marker, and the plants set at the intersections of the marks. Fifteen plants of each variety were used. The soil was cultivated frequently, four times in all, until the plants were too large to admit of the passage of a horse between the rows without injury to the leaves. The plantation was hoed twice in order to kill the weeds not destroyed by the cultivator, and to loosen the soil close to the plants. The tobacco was cut on September 13, and taken to the curing house where, after it was cured, the plants were stripped and the weights of the leaves taken.

The season was not very favourable to tobacco, the weather being cool or wet at the time when it should have been hot. The yields, however, from the different varieties, were large. It must be pointed out, however, that it would be difficult to obtain such yields on large areas.

In the following table particulars are given of the date of topping, total weight of first grade dry leaves, weight of second grade dry leaves, weight of third grade dry leaves, estimated total weight per acre of dried leaves, and stage of maturity at time of cutting :—

TOBACCO—TEST OF VARIETIES.

Name of Variety.	Seedsman.	Date of Topping.	Yield per acre, 1st grade dry leaves.	Yield per acre, 2nd grade dry leaves.	Yield per acre, 3rd grade dry leaves.	Total yield per acre, dry leaves.	Condition of leaves when cut.
			Lbs.	Lbs.	Lbs.	Lbs.	
Pennsylvania Seed Leaf	Thorburn	Aug. 5	1,521	449	1,832	3,802	Spots beginning to appear.
Improved White Burley	Burpee	" 16	2,613	319	319	3,251	Yellow and spotted with yellow.
Small Havana	Ewing	July 26	1,521	657	847	3,025	Spots beginning to appear.
Maryland	"	Aug. 8	2,092	398	346	2,836	" "
Brazilian American	Thorburn	" 8	1,573	622	536	2,731	Still green.
Big Havana	Evans	July 29	933	1,037	709	2,679	Spots beginning to appear.
Comstock Spanish	Burpee	" 28	1,262	691	657	2,610	" "
Gouch	Evans	Aug. 3	1,521	311	415	2,247	Spotted, spots almost yellow.
White Stem	Henderson	" 16	1,521	277	432	2,230	Still green.
Kentucky Yellow	Thorburn	" 4	1,677	380	173	2,230	Spots beginning to appear.
Zimmer's Spanish	Henderson	" 1	864	743	527	2,134	" "
East Hartford	Evans	" 6	1,516	359	219	2,094	Spotted, but spots not yet yellow.
Primus	Henderson	" 3	1,296	459	319	2,074	" "
Tennessee Red	Thorburn	" 23	1,516	279	259	2,054	Still green.
Kentucky Burley	"	" 23	1,259	426	296	1,981	Some yellow, others almost.
Cuban Seed Leaf	Evans	July 26	899	743	311	1,953	Spotted, but spots not yet yellow.
White Burley	"	Aug. 4	1,593	204	93	1,890	Leaves yellow.
Yellow Mammoth	Thorburn	" 23	1,210	324	281	1,815	Still green.
Latakia	Evans	" 2	1,111	519	185	1,815	Spotted, but spots not yet yellow.
Big Oronoka	"	" 2	1,504	190	104	1,798	Spots beginning to appear.
Sterling	Thorburn	" 8	1,148	444	185	1,777	" "
Virginia Oak Hill Yellow	"	" 8	605	929	238	1,772	" "
Connecticut Seed Leaf	"	" 8	1,111	315	315	1,741	" "
Safrano	"	" 16	1,185	315	204	1,704	" "
Gold Leaf	Henderson	" 8	1,089	311	294	1.694	" "
Conqueror	Thorburn	" 3	1,124	311	225	1,660	" "
Oronoka Yellow	"	July 31	1,141	311	138	1,590	Spotted, but spots not yet yellow.
Hyco	Henderson	Aug. 1	1,089	277	156	1,522	Spots beginning to appear.
Blue Pryor	Thorburn	" 8	1,175	225	121	1,521	" "
Sumatra	"	" 1	994	302	194	1,490	" "
Turkish Aromatic	"	" 8	982	222	241	1,445	" "
Climax	"	" 2	957	259	199	1,415	" "
Yellow Pryor	"	" 2	982	315	111	1,408	" "
Bonanza	Burpee	" 8	834	241	333	1,408	Green, except tips of some leaves.
Famous	Ewing	" 16	1,124	173	86	1,383	Spots beginning to appear.
Tuckahoe	Thorburn	3 3	1,019	204	148	1,371	" "
Honduras	"	July 31	1,003	277	69	1,349	" "
Hester	Henderson	" 30	574	500	130	1,204	" "
Granville Co. Yellow	"	Aug. 2	611	426	148	1,185	Spotted, but spots not yet yellow.
Lancaster Co. Broad Leaf	Burpee	July 28	570	311	259	1,140	Still green.
Oronoka White Stem	Thorburn	Aug. 2	691	216	108	1,015	Spots beginning to appear.
Florida	Henderson	" 2	588	311	86	985	Distinctly spotted with yellow.
Canelle	Ewing	July 14	363	173	173	709	" "
Harby	Evans	" 22	406	204	93	703	" "
Persian Muscatelle	Childs	" 20	333	148	222	703	" "
Persian Rose	Thorburn	" 29	359	160	180	699	Spots beginning to appear.
Havana	"	" 21	311	69	277	657	Distinctly spotted with yellow.

In addition to the varieties grown in small plots, three kinds, White Burley, Havana Seed Leaf, and Little Oronoka, were grown on a larger scale, one and one-half acres in all being devoted to these varieties. Part of the land was manured at the rate of 20 tons per acre with well rotted barnyard manure, and otherwise received the same treatment as described for the smaller plots.

As the seed was not received until late, the plants were not set out until June 27, which was not as early as desirable, and on this account the Havana Seed Leaf and Little Oronoka were not as far advanced at the time of cutting as they should have been. The yield of White Burley was also much reduced on this account. The proportion of third grade is large owing to sand blowing and injuring the leaves badly.

The tobacco was cut on September 13 and 14, and taken to the new curing house, where the plants were hung on laths and cured, after which the leaves were stripped off and made into hands, and the tobacco is now ready for fermentation.

The following table gives the results obtained from the three varieties tested :—

TOBACCO—LARGER PLOTS.

Variety.	Yield per acre, first grade, dry leaves.	Yield per acre, second grade dry leaves.	Yield per acre, third grade, dry leaves.	Total Yield per acre, dry leaves.	Condition when cut.
	Lbs.	Lbs.	Lbs.	Lbs.	
White Burley............	768½	140	403½	1,312	Leaves yellow.
Havana Seed Leaf	711	171¼	539	1,421¼	Yellow spots beginning to appear.
Little Oronoka	859	152	183½	1,194½	" "

FOREST BELTS.

In the Report for 1897 a table was published giving the measurements of trees in the forest belts at the Central Experimental Farm. This table is again published this year with the additional measurements which have been taken in the meantime.

In addition to the measurements hitherto taken, the diameter of the trees at a height of 4 feet 6 inches from the ground was recorded this year. It is intended that the measurement taken at this height will take the place of that, one foot from the ground, as it will be more valuable. As many who now receive the Annual Report did not do so in 1897, it has been thought wise to repeat the matter published that year, in which the forest belts are described and the objects for which they were planted, explained, making such changes as are necessary after the two years which have elapsed since then.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries; the belt on the western boundary is 165 feet wide, and that on the northern boundary, 65 feet; their total length being nearly 1¾ miles. The number of trees growing in these belts, including those in an evergreen clump, is about 20,500. The objects, for which these forest belts were planted, are well expressed in the report of the Director for 1893 as follows :—

"There were several objects in view in planting the belts of forest trees which line the west and north sides of the farm. One was to test by actual experiment with a number of different species, the comparative results in growth and development to be had by planting at different distances apart. Five feet by five, five feet by ten and ten feet by ten were the distances chosen for these tests. Another question on which information was desired was the relative growth to which trees would attain when planted

in blocks of single species as compared with those planted in mixed clumps where they are associated with a number of other sorts. Further information was sought as to how far the crops on the farm located near these tree belts will be influenced by the shelter they would afford as growth progressed. In the planting, the grouping was also designed with the object of producing pleasing effects on the landscape by the intermingling and blending of varieties. The main purpose, however, was to get all the useful data possible with regard to the more important timber trees of economic value so that object lessons in tree growth might be available to any who in future might desire to study this subject or to engage in the enterprise of timber growing."

Although it is but eleven years since the first trees were planted in the belts referred to, the growth already made is a useful object lesson and should encourage the more extensive planting of timber trees. The soil in which the trees were planted was in many instances poor, and while a number of species appear to succeed almost as well on poor as on good land, yet some kinds require good soil in order to grow them successfully. As to the distance apart at which it is desirable that trees should be planted, those which were put five by five feet apart are making, in most cases, the best trees for timber purposes, as the lower limbs are dying, leaving the trunks clean which will make the wood freer from knots than where planted ten by ten, or ten by five feet apart, as at those distances there are, as yet, few instances where the lower limbs have died. The trees planted five by five feet apart, also, make more growth in height than where wider planting was adopted, but the diameter of the trunk is not so great. The closely planted trees are more protected from storms and there are fewer broken tops and crooked stems. The desirability of close planting was also very apparent until quite recently in the condition of the surface of the ground where the trees are ten feet apart, which, in a number of cases, still required cultivation although the trees had been planted for eight years ; as it was necessary, in order to keep sod from forming and checking the growth of the trees, to cultivate the soil, whereas, in most instances, where the trees are planted five by five feet apart, the surface soil was kept shaded and moist, and sod did not form. As the conditions of soil are different in the belts where the trees are planted in clumps of a single species and where the several kinds are mixed together, a fair comparison of these two methods of planting cannot yet be made, but the advantages derived from mixing the leafier sorts of trees with those which are not very leafy, are already apparent. Where thin foliaged trees had been planted five by five feet apart and had had eight years' growth, the sod still formed very readily unless the soil was kept cultivated, thus showing that sufficient shade was not afforded to prevent the growth of grass and weeds.

None of the trees in the forest belts were cultivated in 1899.

Owing to the unsuitability of soil and climate, the following kinds of trees have not succeeded in the forest belts along the Western boundary, and in consequence most of them were removed this autumn and part of the land replanted with other species :

Species removed :—Red Maple, Norway Maple, European Mountain Ash, Buttonwood, Horse Chestnut, Kentucky Coffee Tree.

TREES PLANTED IN THE FOREST BELTS IN 1899 :—As the experience of the past eleven years had proven that in many cases trees planted 5 by 5 feet apart had required a great amount of cultivation, in order to give them favourable conditions for making good growth, and in consequence had proven rather expensive, it was decided, when replanting the vacant places this year, to plant the trees closer together. The method adopted was to plant both trees and shrubs, the latter, which were in the majority, being used for the purpose of getting the ground shaded in as short a time as possible, so that weeds would be smothered, moisture conserved, and the soil kept from baking, which would obviate the necessity of cultivating.

Two blocks of trees were planted, in one of which the following species were planted for permanent trees :—White Pine, 10 by 12 feet apart ; Hard Maple, 10 by 12 feet apart. Spaces have been left in this block for White Ash, which when planted in the spring of 1900 will be 10 by 5 feet apart. The remainder of the block is made up of

Box Elder, Rosemary Willow (Salix rosmarinifolia), Ninebark (Neillia opulifolia) and Alder buckthorn (Rhamnus Frangula), all of which were planted for the purpose of filling in the spaces between the permanent trees. When all the trees in this block are planted every tree and shrub will be just 2½ feet apart each way.

In the other block, the following trees have been used as permanent trees :—Black Walnut, 10 by 10 feet apart ; Hard Maple, 10 by 10 feet apart ; and European Larch, 10 by 10 feet apart, while Box Elder, Sand Cherry and Alder Buckthorn have been used for filling in.

The total number of trees and shrubs planted, with height of same, was :—

Name.	Number planted.	Height when planted.
White Pine *(Pinus Strobus)*	186	9 to 12 inches.
Black Walnut *(Juglans nigra)*	137	3 ft. (2 yrs. old.)
Hard Maple *(Acer saccharinum)*	304	18 to 24 inches.
European Larch *(Larix europæa)*	99	8 "
Box Elder *(Acer Negundo)*	918	4 to 6 "
Ninebark *(Neillia opulifolia)*	461	4 to 6 "
Sand Cherry *(Prunus pumila)*	420	4 "
Alder Buckthorn *(Rhamnus Frangula)*	480	4 to 6 "
Norway Spruce *(Picea excelsa)*	75	12 to 15 "
Rosemary Willow *(Salix rosmarinifolia)*	1819	unrooted cuttings.
Total	4899	

GROWTH of Trees in the Forest Belts

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average			
					1895.		1896.	
			feet.	years.	ft.	in.	ft.	in.
Black Walnut—Juglans nigra.....	Low sandy loam	1888	5 × 5	1	9	11½	10	6
" "	"	1888	10 × 10	1	5	5	5	8½
" "	Sandy loam with small stones.	1889	5 × 5	2	12	8	13	9
" "	" " ..	1889	10 × 10	2	8	4½	8	7½
" "	Clay loam....	1888	10 × 5	1	12	5	13	2
Butternut—Juglans cinerea.......	Low sandy loam	1889	5 × 5	1	9	11	10	7
" "	"	1888	10 × 10	1	6	2½	6	9
Silver-leaved Maple—Acer dasycarpum.	Light sandy loam	1889	5 × 5	3	23	2	24	4
" "	"	1889	10 × 10	3	22	6	23	1
European White Birch—Betula alba	"	1889	5 × 5	3	23	1	25	4
" " ..	"	1889	10 × 10	3	24	11	26	7
Canoe Birch—Betula papyrifera...	"	1889	5 × 5	3	21	9	23	7
" " ...	"	1889	10 × 10	3	21	2	23	5
Yellow Birch—Betula lutea......	"	1889	5 × 5	3	16	6	17	1
" "	"	1889	10 × 10	3	16	1	16	7
White Elm—Ulmus americana....	Sandy loam	1889	5 × 5	3	14	5	14	4
" "	"	1889	10 × 10	3	13	9	14	..
Black Ash—Fraxinus sambucifolia.	Black muck..	1889	5 × 5	2	12	..	12	11
" " ..	Low sandy loam	1889	10 × 10	2	8	4	9	3
Green Ash—Fraxinus viridis.....	Black muck.................	1889	5 × 5	3	15	..	15	11
" "	Low sandy loam	1889	10 × 10	3	14	3	15	5
Red Ash—Fraxinus pubescens.....	Black muck.	1889	5 × 5	2	15	5	16	11
" "	Light sandy loam..........	1889	10 × 10	2	12	5	13	8
White Ash—Fraxinus americana..	Black muck...........	1889	5 × 5	3	18	5	20	8
" "	Light sandy loam	1889	10 × 10	3	15	9	17	9
Black Cherry—Prunus serotina....	Light sandy loam and gravel.	1889	5 × 5	3	16	7	17	4
" "	" " ..	1889	10 × 10	3	18	2	19	4
Box Elder—Negundo aceroides....	Light sandy loam...........	1889	5 × 5	2	19	1	20	6
Bolle's Poplar—Populus alba Bolleana.	"	1890	5 × 5	1	24	2	26	4
" " ..	"	1890	10 × 10	1	22	11	25	4
				in.				
Scotch Pine—Pinus sylvestris......	Sandy loam with gravel......	1888	5 × 5	18	14	4	16	9
" "	" " ...	1888	10 × 10	18	11	..	13	3
" "	Low sandy loam with gravel.	1888	5 × 5	18	13	4	15	4
" "	Low sandy loam	1888	10 × 10	18	11	6	13	8
" "	Light sandy loam...	1888	10 × 5	18	14	10	17	2
" "	Clay loam..................	1888	10 × 5	18	11	11	14	2
" " . ..	Light sandy loam and gravel.	1888	10 × 5	18	14	11	17	1
" "	" " ..	1887	3 × 3	9	14	3	16	6
Austrian Pine—Pinus austriaca....	Light sandy loam...........	1889	5 × 5	18	8	1	10	2
" "	"	1889	10 × 10	18	7	9½	9	10½
" "	"	1888	10 × 5	15	8	11	10	11
" "	Clay loam..........	1888	10 × 5	15	9	2½	10	11½
" "	Light sandy loam and gravel.	1888	10 × 5	15	10	5	12	3
" "	" " ..	1887	3 × 3	15	10	6	12	1
White Spruce—Picea alba.........	Light sandy loam..........	1889	5 × 5	15	8	5	9	10
" "	"	1889	10 × 10	15	7	8	8	11
Norway Spruce—Picea excelsa	"	1889	5 × 5	18	10	8	11	10
" "	"	1889	10 × 10	18	10	1	12	2
" "	"	1888	10 × 5	15	10	10	13	1
" "	Clay loam............... ..	1888	10 × 5	15	11	4	13	9
American Arbor-vitæ—Thuya occidentalis.	Low sandy loam and black muck.	1889	5 × 5	18	9	1	10	2
" " ..	Low sandy loam	1889	10 × 10	18	8	..	8	10
				feet.				
European Larch—Larix europæa..	"	1888	5 × 5	2	19	3	20	3
" " ..	"	1888	10 × 10	2	17	9	19	3
White Pine—Pinus Strobus.	Light sandy loam with gravel.	1889	5 × 5	8 to 10 in.	10	11	13	4
" "	" " ..	1889	10 × 10	8 to 10 in.	10	1⅓	12	7

In the above table the average growth is given of most of the important timber trees growing in the measurements of average trees, and give a fairly accurate idea of the growth these make each year. Until many of them began to spread so much that it was difficult to determine the leader, hence the total height where the main branches are very divergent, or the extremities pendulous, the total height is given as less

at the Central Experimental Farm.

Height, Autumn of			Average Growth in								Average Circumferance 1 Foot from Ground.						Average Diameter 4′ 6″ from ground.
1897.	1898.	1899.	1892	1893	1894	1895	1896	1897	1898	1899	1893	1895	1896	1897	1898	1899	1899.
ft. in.	ft. in.	ft. in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
10 9	10 5	10 9	26	23	21	18	6	3	0	4	5 1/3	7 2/3	8 [illegible]	8 [illegible]	8 [illegible]	9 1/6	1 [illegible]
5 10½	6 1	6 7	12	17½	11	9	3½	2	3	6	3	5	5½	5 [illegible]	6 [illegible]	7 [illegible]	[illegible]
14 5	14 10	15 4	37½	28	36	19	13	8	5	6	.....	8½	9 [illegible]	9 [illegible]	10	10 [illegible]	[illegible]
8 12½	9 11	10 10	15	25	28	15	3	5	7	11	.....	7 3/4	8 [illegible]	8 3/4	9 2/3	10 [illegible]	[illegible]
13 5	13 11	14 3	31	31	31	17½	9	3	5	4	.....	10 3/4	11 [illegible]	12 [illegible]	13 [illegible]	12 [illegible]	[illegible]
10 10	10 10	11 3	19	24	18	10½	8	3	0	5	.....	6½	7 [illegible]	7½	7 1/12	7 [illegible]	[illegible]
7 4	8 2	9 5	18	15	15	16	7	7	10	19	.....	4 2/3	6 1/6	6 5/8	7½	8 1/3	1 3/8
25 3	25 9	26 9	37	40	33	29	14	11	6	11	.....	9¼	9½	9 2/3	9 19/24	9 5/6	2½
23 7	23 10	24 2	53	38	33	20½	7	6	3	4	.....	13	13 [illegible]	14 [illegible]	14 7/12	1[illegible]	3 [illegible]
28 8	30 4	32 4	58	18	17	14	27	40	21	24	.....	10 1/3	11 [illegible]	12 [illegible]	12 [illegible]	11 [illegible]	3 [illegible]
31 1	33 7	36 4	36	32	30	30	20	54	28	33	.....	15 [illegible]	17 [illegible]	19 [illegible]	21	23 [illegible]	5
25 10	27 7	29 6	46	36	22	14	22	27	21	22	.....	9 2/3	10	10 5/12	11	11 [illegible]	[illegible]
25 7	27 9	30 ..	34	24	33	28	27	26	26	27	.....	13	11 1/4	15 [illegible]	16 7/12	17 [illegible]	[illegible]
18 6	19 11	21 3	47	30	35½	21	7	17	17	17	6 3/4	8 1/4	9 [illegible]	[illegible]	10	10 [illegible]	2 7/24
18 1	19 4	20 5	41	33	26	21	6	18	15	13	8	11½	12 [illegible]	13 [illegible]	14 7/24	14 [illegible]	[illegible]
15 1	15 2	16 5	33	38	27½	23	0	9	1	15	5½	6 2/3	7 1/3	7 2/3	8 5/24	8 2/3	1 1/2
14 9	16 1	18 2	44	31	25	18	3	9	16	25	6	9	9 5/6	10 7/12	11 5/6	13½	3
13 11	16 2	16 11	38	26	32	8	11	12	28	8	5	6 1/4	6 19/24	7 [illegible]	8 1/3	8 [illegible]	[illegible]
9 1	9 4	11 3	20	23	19	8	11	0	2	24	3½	5	5 11/24	5 [illegible]	6 7/12	7 [illegible]	[illegible]
17 7	18 11	19 8	30	31	29	20	11	20	10	9	6 1/4	7 2/3	8 [illegible]	9 [illegible]	10 1/12	10 [illegible]	[illegible]
15 5	15 7	16 2	28	24	21½	21	14	3	2	7	7 1/4	8½	9 1/3	9 [illegible]	10 1/12	10 [illegible]	[illegible]
18 4	19 8	21 1	31	34	39	33	18	17	15	18	5	7	8 [illegible]	8 [illegible]	9 1/12	10 [illegible]	[illegible]
14 5½	14 11	16 .	26	32	27½	21	15	9	5	13	4 1/3	6 1/4	7 1/3	7 [illegible]	8 1/3	9 [illegible]	[illegible]
22 3	22 8	23 5	32	41	58	36	27	19	4	9	5 1/3	7	8 [illegible]	[illegible]	9	9 [illegible]	[illegible]
19 7	20 4	21 9	38	38	37	25	24	22	10	17	5 3/4	8 2/3	9 [illegible]	10 [illegible]	11 1/3	11 [illegible]	2 [illegible]
18 4	18 7	19 ..	29	21	22	19	9	12	6	4	.....	8½	9 1/4	9 [illegible]	9 [illegible]	10	2 1/3
21 2	21 9	22 9	40	39	32	26	22	22	7	12	.....	11 2/3	12 [illegible]	13 5/8	14 1/3	14 7/12	3 1/4
22 2	23 4	24 2	38	38	39	29	17	20	13	11	8 1/4	10 1/4	11 1/6	11 1/12	12 1/6	12 3/4	3
27 11	... ...	....	46	68	63	70	26	19	....	....	.....	11 1/4	12 1/4	12 2/3	...	...	
27 11	... ...	....	40	55	70	74	29	31	....	...	.....	12½	15 3/8	17 1/8	.....	.....	
18 11	20 11	22 ..	29	28	35½	31	29	26	24	14	7 5/8	10	11	11 7/8	12 [illegible]	13 [illegible]	3 3/4
15 7	17 8	19 3	15	22	28½	29	27	28	25	19	9 1/12	12	15 1/6	16½	17 5/6	19 [illegible]	4 [illegible]
17 6	19 3	20 11	26	29	32½	29	24	26	23	19	7 [illegible]	9 1/3	10 [illegible]	11 [illegible]	12 [illegible]	13	[illegible]
15 8	17 9	19 9	30	23	25	29	26	21	23	24	8 [illegible]	13 1/4	15 3/8	17 [illegible]	19 [illegible]	20 [illegible]	4 [illegible]
19 2	21 3	23 1	25	21	35	34	28	24	25	21	.....	15 [illegible]	18	20 [illegible]	22 [illegible]	24 [illegible]	6 1/6
16 3½	17 6	19 4	20	23	32	31	27	15½	20	21	.....	12 1/4	14 7/12	16 [illegible]	18	19½	4 [illegible]
18 8	20 2	21 8	29	30	36	33	26	19	19	18	.....	15	17 [illegible]	18 [illegible]	[illegible]	22	[illegible]
18 9	20 9	22 5	22	23	26	28	27	27	24	20	5½	8 1/4	9 [illegible]	9 [illegible]	10 [illegible]	11	4 [illegible]
12 ..	14 1	15 11	12½	18	23	22½	25	22	22	23	.....	9	11 [illegible]	12 [illegible]	12 [illegible]	14 [illegible]	3 [illegible]
11 11	13 7	15 ..	12	16	22	24	25	24½	15	17	.....	10 1/3	13 1/4	15 [illegible]	14 [illegible]	[illegible]	[illegible]
12 5	13 4	15 6	18	21	24	24	24	18	21	26	.....	9 1/4	10 [illegible]	[illegible]	[illegible]	15 [illegible]	[illegible]
12 4½	13 7	15 ..	17	19	24½	22	21	17	15	17	.....	9½	11 [illegible]	12 19/24	14 [illegible]	15 [illegible]	3 [illegible]
13 11	15 9	17 8	22	22	26	25	22	20	22	23	.....	10 3/4	13 [illegible]	14 1/12	16 [illegible]	18 1/4	4 [illegible]
13 4	14 10	16 5	21	19	22	21	19	15	18	18	.....	8½	9 [illegible]	10 [illegible]	11 [illegible]	11 [illegible]	[illegible]
10 9	11 7	12 4	12	21	21½	21	17	11	10	9	.....	6 1/4	6 [illegible]	7 [illegible]	7 [illegible]	8 [illegible]	1 [illegible]
9 11	11 2	12 8	10	18	22	19	15	12	15	19	.....	6½	7 [illegible]	8 [illegible]	10 5/12	11 [illegible]	2
13 ..	13 11	14 10	19	29	29	18	14	14	10	11	6	8 1/4	9 3/4	10 [illegible]	11 [illegible]	11 [illegible]	2 [illegible]
14 5	16 2	18 ..	16	23	25	27	25	27	22	22	5	8 1/4	10 13/24	11 13/24	12 [illegible]	13 [illegible]	2 [illegible]
15 9	18 ..	20 4	19	25	23	28	27	32	30	28	.....	8	9 [illegible]	10 [illegible]	11 [illegible]	13 [illegible]	3
16 2	18 11	21 11	18	20	31	32	29	29	32	37	.....	8 1/3	9 1/20	11 1/40	12 3/4	14 1/20	3 7/20
11 6	12 5	13 9	21	23	15	15	13	16	11	16	.....	7 3/4	9½	10 11/12	12	12 2/3	2 1/12
9 10	11 6	12 9	20	18	15	15	10	12	19	16	.....	7 3/4	9 1/8	10 13/24	11 3/4	12 3/4	1 5/6
21 9	23 8	25 4	35	41	45	31	12	18	23	20	8	11	11 [illegible]	12 19/24	13 [illegible]	13 [illegible]	3 [illegible]
20 5	22 7	25 5	33	37	42	40	18	14	22	34	7½	12	13 [illegible]	14 5/8	17 [illegible]	18 [illegible]	4 [illegible]
15 8	18 4	20 1	19½	27½	27½	27½	29	28	28	27	4½	8	10	10 [illegible]	11 [illegible]	12 [illegible]	3 [illegible]
15 2	18 3	20 .	16	24½	24	27	29	31	33	21	5	9 1/4	11 7/12	13 1/12	15 5/12	17 [illegible]	4 [illegible]

forest belts at the Central Experimental Farm. The figures published are the average results from the 1897, and in some cases until 1898, the annual growth was taken in measuring the trees, but the crowns of is now taken. This change has lessened the apparent annual growth for those years, and in some cases, than that of the year previous.

ARBORETUM.

Although last winter was severe, and comparatively little snow fell until March, the number of trees and shrubs which were winter-killed was little, if any, above the average. The genus *Prunus* suffered, perhaps, more than any other in this regard: the reason probably being that many of the varieties were grafted on tender stocks, as most of the losses occurred from root-killing. Notwithstanding the losses, however, which occur every winter, the collection is getting larger each year.

This year a catalogue was published of the trees and shrubs which have been tested up to this time, and the introductory matter from that catalogue, which is herewith quoted, will give some idea of the progress which has been made since 1889, when the first planting was begun:—

"When the Central Experimental Farm was established at Ottawa, in 1886, it was decided that a portion of the land purchased, consisting of sixty-five acres out of a total of four hundred and sixty-five, should be devoted to the purposes of an Arboretum and Botanic Garden, where trees, shrubs and plants from all parts of the world could be brought together and tested as to their hardiness and adaptability to this climate.

"Work was begun on the Experimental Farm in the spring of 1887, but the first planting in the Arboretum and Botanic Garden was not done until the autumn of 1889. During that season 200 species of trees and shrubs were planted, two specimens of each, grouped in their natural orders. In planting these they were placed at such distances from each other as was thought would be sufficient to permit of the full growth and development of the individual specimens. Many additions were made from year to year, and in 1894 the collection contained about 600 species and varieties. Up to that time this part of the work had been in charge of Dr. James Fletcher, Botanist and Entomologist of the Dominion Experimental Farms, under whose care great progress had been made. In the spring of 1895, at the request of Dr Fletcher, a change was made, and the Botanic Garden and Arboretum was placed in charge of Mr. W. T. Macoun, who was then the Director's Assistant and Foreman of Forestry. In the spring of 1898 Mr. Macoun was appointed Horticulturist of the Central Experimental Farm and Curator of the Arboretum and Botanic Garden, and under his energetic management, aided by such advice and oversight as the Director has been able to give, this collection has been rapidly increased. The total number of species and varieties which have been, or are now, under test, all of which are referred to in the accompanying catalogue, is 3,071. Of these, 1,465 have been found hardy, 330 half hardy, 229 tender, 307 have been winter-killed, and 740 have not been planted long enough to admit of an opinion being given as to their hardiness. Where they have been tested one or more winters an opinion has been expressed on this point based on the experience had. Those which have passed through one or more winters uninjured, or with very slight injury to the tips only of the branches, have been pronounced hardy; where the new wood has been killed back from one-fourth to one half its growth, such are said to be half hardy, and those which have had their wood killed in winter to the snow line or to the ground have been noted as tender. Where the experience of one winter only has been had, the conclusions reached can only be regarded as tentative, and may require modification in future.

"In the catalogue the botanical names of the trees and shrubs are arranged alphabetically, and where a species or variety has a common name this also is given. The countries are named of which the trees and shrubs are native, also the year in which they were planted. In compiling this work the nomenclature and classification of the "Index Kewensis" and the "Kew Guide" have been adopted. The name of the species or variety is printed in bold faced type, followed by the author's name in small capitals. The term *Hort.* indicates a garden or gardener's variety. Synonyms of the genera and species are printed in italics. The common names given are those found in the leading botanical works of modern authors.

"While a large number of synonyms have been recorded, it is probable that there are still included in this catalogue some which are listed as species or varieties which are really synonyms. In recording the synonyms the names given are only those under

which the species or varieties have been received at the Experimental Farm and do not include all the known synonyms in each case. There has not yet been time to carefully identify every species and variety under test, and it is quite probable that there may be some among them wrongly named. Any botanists who are making a special study of any family or genus would confer a great favour on the authors if they would kindly note any apparent inaccuracies and report them, so that such errors may be rectified.

"The Arboretum at the Central Experimental Farm is now much visited and an increasing interest manifested in the progress of the work by botanists as well as by the general public. It is hoped that this catalogue will be useful to visitors as a hand-book and that its distribution among botanists and others specially interested in the growth of trees and shrubs in this country and abroad will convey much information as to the relative hardiness of species in this part of Canada and at the same time give correct ideas as to the character of the climate in this part of the Dominion."

PROGRESS OF THE WORK.

Little change has been made in the routine work in connection with the Arboretum and Botanic Garden during the past year. The grass is kept cut with a pony lawn mower; circles are kept without grass about each specimen and the surface soil within these kept loose with a hoe; notes are taken of the hardiness, growth and time of blooming of the trees and shrubs, and they are also kept well labelled. An addition of 200 specimens was made to the herbarium of the Arboretum and Botanic Garden, which was begun last year, making a total of 735 species and varieties.

An area of about two acres was seeded down to lawn grass this year, which will improve the appearance of that part of the Arboretum very much. Several acres which had hitherto been in sod were ploughed up this year and planted with Indian corn. After the crop was removed the land was again ploughed, and this will be in good condition for planting next year.

A new label has been adopted for the trees, shrubs and plants, which will prove much cheaper and more serviceable than the enamelled labels hitherto used, and is much more useful than the small zinc labels, which were rat er difficult to read. They are 3 by 6 inches, made of galvanized iron, painted white, and are supported by heavy wire bent to form two legs and soldered to the back of the label. The common and the scientific name of the plant and the country of which it is a native, are painted in black letters on each label.

SOME GOOD LOW-GROWING FLOWERING SHRUBS.

It very frequently happens that one's grounds will not permit of having many large shrubs or trees, and a list of some of the best low-growing shrubs of compact habit should prove useful to those who are thus situated. The following shrubs cover a blooming period from early spring until autumn, and with the addition of some good perennials would make a small place very attractive. Although some of the kinds mentioned are not perfectly hardy as far as their wood is concerned, they nearly always produce a fine display of blossoms. Most of them are so low-growing that they are covered with snow nearly every winter and are thus well protected.

In my Report for 1897 a list was published of 100 of the best ornamental trees and shrubs, and the following list may be used as a supplement to that one by those having large grounds:

Berberis Aquifolium:—Oregon Grape: British Columbia. Height, 1 to 2 feet. In bloom third week of May. Flowers bright lemon-yellow. Leaves evergreen, smooth and shiny assuming attractive shades in autumn.

Calluna vulgaris.—Heather: Northern and Central Europe. Height 1 to 3 feet. Bloom July and August. This is too well known for description. In the protection

of an evergreen hedge where the snow covers it in the winter, this pretty little shrub is succeeding admirably.

Caragana grandiflora.—Large flowered Caragana: Caucasus. Height 4 feet. In bloom third week of May. Flowers large, bright yellow, pea-shaped. Very pretty when in full bloom. This somewhat resembles *C. frutescens*, but has larger flowers.

Cassandra calyculata.—Leather Leaf: Canada: United States, Height 1 to 3 feet. Blooms in June. Flowers pure white in terminal racemes. This pretty native shrub has succeeded well here, planted in moist soil.

Ceanothus americanus Marie Simon: Height 2 feet. Begins to bloom in third week of June. Flowers small, pale pink, borne in clusters. This is a profuse bloomer and is very pretty when at its best. It kills back when under the protection of an evergreen hedge, but always is a mass of bloom in summer.

Clethra alnifolia.—Sweet Pepper Bush: United States. Height 3 to 4 feet. In bloom first week of August. Flowers small, white, in long clusters. Almost hardy. This is not a very attractive shrub, but it flowers at a time when few trees or shrubs are in bloom and is, therefore, desirable.

Cytisus hirsutus.—Europe: Height 1 foot. In bloom first week of June. The flowers of this little shrub are bright yellow and pea-shaped. It is quite attractive when in full bloom. Although not perfectly hardy, a good show of bloom is always assured.

Cytisus purpureus.—European Alps: Height 6 to 12 inches. In bloom fourth week of May. Flowers pea-shaped, bright purple, and borne in the axils of the leaves along the branches. One of the prettiest dwarf shrubs tested here and almost hardy.

Daphne Cneorum.—Garland flower: Eastern Europe. Height 1 to 1½ feet. In bloom second week of May. Flowers bright pink, and sweet scented. A very pretty little evergreen, quite suitable for flower borders. It blooms a second time in autumn.

Daphne Mezereum—Common Mezereon: Europe. Height 3 to 4 feet. Blooms early in May. Flowers red, very sweet scented. This is a well known early flowering shrub. It is not quite hardy at Ottawa, but if given some protection it will bloom very well.

Deutzia gracilis.—Japan Snow-flower: Japan. Height 12 to 18 inches. In bloom first week of June. Flowers white, borne profusely in terminal clusters. It is unfortunate that this attractive little shrub is not hardier. Some seasons it is covered with bloom, while again after a very severe winter there is very little. The wood kills back usually to near the ground. It is much used by florists for forcing.

Diervilla Florida (rosea) nana foliis variegatis.—Dwarf Variegated Weigelia: Japan. Height 1 to 2 feet. In bloom first week of June. The flowers are of a delicate shade of pink and the leaves well variegated with green and yellow. Not altogether hardy, but if planted where the snow will cover it well or where it may be artificially protected, it will succeed well.

Genista tinctoria.—Dyer's Greenweed. Europe. Height 1 to 2 feet. Begins to bloom in fourth week of June. Flowers bright yellow, pea-shaped. A very pretty little shrub, continuing in bloom for some time. There is a double-flowered variety, which is also good.

Hedysarum multijugum.—South Mongolia. Height 2 to 5 feet. In bloom 4th. week of June. Flowers bright pink, pea-shaped, borne in racemes. This shrub is of

graceful habit and has attractive foliage, and is a striking object when in full bloom. It is not, however, perfectly hardy.

Hypericum kalmianum.—Kalm's St. John's Wort: Ontario. Height 2 to 4 feet. Begins to bloom second week of July. Flowers large, bright yellow. A very ornamental shrub, continuing in flower until late in the summer.

Jamesia americana.—Rocky Mountains. Height 1 to 2 feet. In bloom 2nd week of June. Flowers white in terminal heads. This is quite a pretty little shrub and when not in bloom the leaves, which have a silvery appearance, make it still ornamental

Lespedeza Sieboldii.—(*Desmodium penduliflorum*). Japan. Height 4 feet. Blooms in September. Although this shrub is killed to the ground every winter, there is usually a profusion of bright purplish-red, pea-shaped blossoms, which are borne on large spikes. This is a very fine autumn flowering shrub.

Lonicera Alberti.—Albert Regel's Honeysuckle. Turkestan. Height 2 to 4 feet. In bloom 4th week of May. Flowers bright pink. This beautiful little honeysuckle with its sweet-scented flowers, pendulous branches, and narrow leaves, is one of the most hardy and desirable shrubs.

Potentilla fruticosa.—Shrubby Cinque-foil, Canada. Height 2 to 4 feet. In bloom 2nd week of June. Flowers large, bright yellow. An attractive shrub when in bloom.

Pyrus (Cydonia) Maulei.—Maule's Japanese Quince. Japan. Height 1 to 3 feet. In bloom 2nd week of May. Flowers bright red. The flowers of this little shrub are very ornamental, and in the autumn, when the golden coloured, highly perfumed quinces are ripe, it makes a very interesting object. It is much hardier than *P. japonica*, of which some authorities call it a variety.

Rhododendron viscosum.—White Swamp Honeysuckle. United States. Height 2 to 4 feet. Blooms in latter part of June. Flowers white, tinged with pink, sweet scented, with a sticky substance on the tubes of the corollas. This is really an Azalea, though now included with the Rhododendrons. It is one of the few hardy species of this genus, and makes an attractive shrub when in full bloom.

Spiræa arguta.—Europe. Height 3 to 4 feet. In bloom 3rd week of May. Flowers pure white, produced very profusely in compact clusters. This is the earliest flowering spiræa grown here, and is one of the best hardy shrubs of recent introduction. It is a graceful little spiræa with pendulous branches, but its chief beauty lies in the abundance of its pure-white flowers.

Spiræa japonica alba (S. callosa alba).—White-flowered Japanese Spiræa. Japan. Height 1 foot. In bloom 2nd week of July. Flowers white in flat heads. This is a neat little shrub, and although not altogether hardy, blooms profusely every year.

Spiræa japonica Bumalda Anthony Waterer.—Europe. Height 1 foot. Begins to bloom 1st week of July and continues in flower for a long time. Flowers bright, purplish-red, borne in compact heads. This is one of the prettiest dwarf shrubs yet tested at Ottawa.

Zanthorrhiza apiifolia.—Parsley-leaved Yellow-root. United States. Height 1 to 2 feet. In bloom 1st week of May. Flowers dark, brownish-purple. It is pleasant to meet this little shrub in early spring with its peculiar, almost chocolate-coloured flowers, and it makes an interesting and pretty object at that time of the year.

AN ADDITIONAL LIST OF GOOD PERENNIALS.

In my report for 1897 a list was published of 100 of the best perennials tested here, and there is reason to believe that it has proven very useful to persons who were desirous of planting some good varieties of perennial plants. In 1898, short descriptions were published of twelve more good sorts, and this year the following species and varieties are added, all of which are well worth planting :—

Cimicifuga racemosa.—Snakeroot. North America. Height 5 to 6 feet. Blooms during 2nd week of July. Flowers small, pure white, on very long spikes. Owing to its great height and striking appearance when in bloom, this is very desirable for the rear of the border.

Epimedium macranthum.—Large-flowered Barren-Wort. Japan. Height 12 to 15 inches. Blooms during 2nd week of May. Flowers white, borne on racemes having from six to ten flowers. A very graceful and pretty plant, the leaves of which are also ornamental. There are several fine varieties of this species, the commonest, perhaps, being *violaceum* with large lilac purple flowers. All the barren-worts are beautiful and this is one of the best.

Euphorbia corollata.—Flowering Spurge. United States. Height 18 inches. Begins to bloom the 1st week of July and continues until autumn. Flowers small, pure white, with a greenish centre, borne profusely on broad umbels. This is a very graceful plant and the flowers should prove excellent for cutting.

Gypsophila Stevenii.—Steven's Chalk Plant. Caucasus. Height 1 to 2 feet. Begins to bloom in the latter part of June. Flowers small, white, numerous, on loose panicles. A little earlier than *G. paniculata* and with larger flowers.

Linum flavum.—Yellow-flowered Perennial Flax. South Europe. Height 12 inches. Begins to bloom during the 3rd week of June and continues all summer. Flowers, medium size, bright golden yellow, produced in abundance on branching heads. On account of the long season during which this plant is in bloom, the profusion of flowers and their attractive appearance, it is a very desirable perennial.

Lupinus polyphyllus.—Many-leaved Lupine. North-west America. Height 3 to 4 feet. Begins to bloom in 1st week of June. This is a fine, showy, stately plant with long spikes covered with deep blue pea-shaped flowers. There are several good varieties including a white one.

Lysimachia Nummularia.—Creeping Jenny; Moneywort. Europe. Creeping. Begins to bloom in the 3rd week of June and continues throughout the remainder of the summer. Flowers deep yellow. This is a pretty little plant, spreading rapidly and succeeding admirably in shady places.

Lythrum Salicaria.—Common Purple Loosestrife. Europe. Height 4 feet. Begins to bloom in July and remains in flower a long time. Flowers small, bright reddish-purple, borne on long branching spikes. As the flowers of a spike are not all open at the same time, the blooming period is much lengthened. It makes a good show in the rear of the border. There is a fine variety *superbum* with rose-coloured flowers.

Malva moschata alba.—White-flowered Musk Mallow. Europe. Height 2 feet. Begins to bloom in the 3rd week of June and continues for some time. Flowers large, pure white, borne in terminal and axillary clusters. A very showy perennial.

Petalostemon violaceus.—Prairie Clover. Prairies of Canada and United States. Height 1 foot. Begins to bloom during 1st week of July. Flowers small, bright

purplish-pink, borne on short heads. This is a very attractive little plant which continues to bloom for a long time and is quite desirable for the front of the border.

Salvia azurea grandiflora.—(S. Pitcheri) Large Blue-flowered Sage. Texas. Height 4 feet. Blooms in September. Flowers are of a lovely shade of blue, borne on long spikes. This is one of the finest autumn flowering perennials.

Yucca filamentosa.—Adam's Needle; Ghost Plant. East Virginia and Southward. In bloom 2nd week of July. Height 4 to 5 feet when in bloom. Plant 12 to 18 inches high. When not in bloom this is a rather stiff, stemless, evergreen plant with broad leaves on the margins of which are white thread-like filaments. When the flower spike appears the plant assumes a different appearance as the spike shoots up to a height of four feet or more, bearing a large number of drooping bell-shaped flowers which are white with a greenish tinge. It now becomes a very striking and beautiful object. It has proven perfectly hardy here without artificial protection.

REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.C.S., F.R.S.C.)

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Ottawa, Dec. 1, 1899.

Sir,—I have the honour to submit herewith the thirteenth annual report of the Chemical Division of the Experimental Farms.

The matters that receive attention therein may be briefly referred to as follows:—

Soils.—The analytical data obtained on a representative sample of soil from certain flooded lands in the Dauphin district, Manitoba, are given. Comparing them with those from soils of the Red River Valley, published by us some few years ago, certain differences are to be noted, the chief of which is the smaller percentage of clay. In all the essential elements, this Dauphin soil is considerably above the average, and quite free from sourness and alkali. With drainage and proper culture it would no doubt prove a very fertile soil.

An instructive example of an impoverished soil was also submitted to analysis. We place side by side the results of its analysis with those obtained from a sample of virgin soil, collected in the vicinity of the field that had been cultivated for many years without any adequate return of plant food. The study of these data will prove of more than ordinary interest to all those possessing partially exhausted soils.

Since it would be impossible, and perhaps undesirable, to insert in this report all the analytical figures resulting from the examination of soils sent in by farmers during the past year, a general account or summary of our conclusions has been written. This not only points out wherein soils of reduced productiveness are deficient, but indicates rational and economical means that can be adopted for their improvement. It should prove a valuable contribution to the literature of this very important question, which is one of wide interest throughout many districts of eastern Canada.

Naturally-occurring Fertilizers.—First in importance of these is the investigation into the merits as a fertilizer of marsh mud—a tidal deposit from the Bay of Fundy.

We determined not only the total amount of plant food present—which is by no means large—but also the proportion of such which is, comparatively speaking, ready for immediate crop use. It has been demonstrated that this proportion is much larger than in ordinary fertile soils (to which in many respects these deposits are similar) and thus we have an explanation for the experience of many farmers who have found an immediate but not a lasting benefit from an application of such substances. To obtain the best returns from the use of marsh mud, organic matter and nitrogen—either as barn-yard manure or as a green crop of clover turned under—must also be furnished. In many instances, the value of these tidal deposits as fertilizers would be increased by a slight dressing of lime.

The interest in swamp muck as a cheap source of humus and nitrogen is apparent from the number of samples sent in for analysis. Of these, nineteen have been submitted to chemical examination and are here reported on.

Other fertilizers that have received attention comprise wood ashes, ashes from a tannery, fish pomace and sludge from the purification of sewage.

Foods and Feeding Stuffs.—We are continuing our investigation as to the relative merits of Canadian grown grasses. It may be possible during the coming year to issue a bulletin on this subject, supplementing the one (No. 19) already published.

In the present report are to be found accounts of the following fodders: Broadleaf hay from New Brunswick, Hay extract, Cotton seed meal, and the seed of 'Lamb's Quarters.' The latter is, unfortunately, a prevalent weed in many parts of the North-west, and the seed, obtained in comparatively speaking large quantities from the thresher, has been employed, after grinding or boiling, as a feeding stuff.

Chemistry of Insecticides and Fungicides.—Several questions relating to materials used in spraying mixtures have been referred to us during the past year. Certain investigations in connection therewith were accordingly undertaken, and since the results will be of interest to fruit growers and orchardists, they are here recorded.

Nitragin.—The experiments with this preparation have been continued with results that must be considered as gratifying. Clover was the legume under trial. The crop of the second year's growth from inoculated seed was very much larger than that from the untreated seed. A striking illustration is given, taken from a photograph of the growing clover.

Soft Pork Investigation.—The work in connection with this inquiry has engaged the greater part of the time of the chemical staff for the past four months, and as a consequence a very large amount of data has been amassed. This investigation is still in progress.

The object of this research is to ascertain, if possible, the cause or causes that lead to the development of 'soft' or 'tender' pork. Softness is a quality that very much reduces the price of bacon in the English market, and since England is Canada's chief market in this commodity and the pork packing industry has for some years past assumed very large proportions, the importance of this inquiry is obvious.

The series of experiments now in course constitute a number of feeding trials, employing neaily 200 animals, under the control of the Agriculturist, and includes the analysis and physical examination of the fatty tissue of the pigs. It is confidently hoped that this investigation, when completed, will furnish results which will allow us to draw definite conclusions regarding the cause or causes of the condition referred to, and thus enable us to furnish information of value to pork producers.

The preliminary report herein gives our data that established the fact that this quality of softness is due to the presence of what might be termed an excess of olein. Olein is a normal constituent of pork fat, and it is only when its natural relation to the other fats present (palmitin and stearin) is disturbed in the direction indicated that it becomes a matter for investigation.

Well Waters.—Of the number received, we here report upon 49; others have been sent, but for one reason or another have been disqualified and not analysed. We have every reason to believe that this branch of our work is widely appreciated by farmers and dairymen, and that it has been fruitful of good results.

Correspondence and Meetings Attended.—From November 30, 1898, to December 1, 1899, 1,267 letters were received and 1,595 dispatched. It is scarcely necessary to add that this phase of our work is to be regarded as one of considerable importance and one, as our statistics show, that is constantly increasing in its demand upon our time.

Addresses have been delivered at a number of the more important agricultural conventions in Ontario, New Brunswick and Nova Scotia during the year.

Samples received for Analysis.—The following schedule denotes the number and nature of the samples received for examination since the writing of our last report, and further, gives the approximate number of these, which for want of the necessary time, still await our attention.

SAMPLES received from Farmers for Examination and Report, November 30, 1898, to December 1, 1899.

Samples.	British Columbia	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Newfoundland.	United States.	Total.	Number still awaiting examination.
Soils	3	9	....	7	13	...	3	....	1	5	41	33
Mucks, muds and marls	1	1	2	7	2	6	6	10	....	....	35	7
Manures and fertilizers	....	....	....	4	6	3	4	....	....	....	17	9
Forage plants and fodders	....	....	1	13	3	3	1	....	...	....	21	15
Well waters	5	5	7	29	7	9	4	2	....	....	68	......
Miscellaneous, including dairy products, fungicides and insecticides	10	25	14	33	18	4	16	8	....	....	128	85
	19	40	24	93	49	25	34	20	1	5	310	149

Tuberculin.—By direction of the Department of Agriculture, we have prepared and forwarded to veterinary surgeons during the twelve months ending November 30, 1899, 1,030,740 minims of tuberculin, equivalent to 17,179 doses—a quantity practically double that sent out the year previous. This has entailed a very large amount of work, consuming, of necessity, a considerable portion of the time of the division.

Reports on 'Spraying for Mustard,' and the 'Preservation of Eggs,' giving an account of certain experiments conducted by this division, have been handed to the botanist and poultry manager, respectively, for insertion in their reports.

Assistant Chemist.—Mr. A. T. Charron B.A., has continued to do most efficient work, rendering assistance of the greatest value in the prosecution of the many and varied branches of research undertaken by this division. It is very largely due to Mr. Charron's ability and industry that I am enabled to present many of the data contained in this report.

For several years past, as is well known, we have been unable to keep up with the work asked of us, making a further increase to the chemical staff a matter of serious consideration. To meet this demand, and more especially at the present time to enable us to cope successfully with the large amount of analytical work connected with the soft pork investigation, Mr. H. W. Charlton, B.A.Sc., Toronto, was appointed second assistant chemist. Mr. Charlton entered upon his duties on November 1, and, although a month only has passed, I can bear testimony to his faithful and careful work. His application is both assiduous and intelligent, and I feel sure he will prove an efficient and reliable man.

The duties in connection with the clerical work of the division, including stenography, have for a number of years past been very largely discharged by Mr. J. F. Watson, to whom my thanks are due for a continuance of good and careful work during the year just closed.

New Chemical Building.—Since August of the present year we have been occupying the new laboratories, erected to replace those injured by fire in 1896. The building contains two laboratories with offices for the chemist and assistants on the main floor, store rooms for chemicals and apparatus in the basement, and rooms for grinding and the preparation and storage of samples, photographic purposes, &c., on the second floor. The laboratories are commodious and well arranged, and I have no hesitation in saying that the work of the Chemical Division will be much facilitated by the increased accommodation that this building, specially designed for chemical investigations, will afford us.

I have the honour to be, sir,
Your obedient servant,
FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

CANADIAN SOILS.

Of the soils received since the issue of our last report, very few, for want of sufficient time, have been submitted to complete analysis. Such samples as were of virgin soil and represented large areas, have, as a rule, been reserved until opportunity will permit of full investigation. The greater number forwarded, however, have been from cultivated fields, and consequently to be considered as 'worn' or partially exhausted soils. These, for the most part, have received a partial examination, and been reported on to the senders. Of the former class (virgin soils) two notable instances have been analysed. We here present the results obtained, with conclusions drawn therefrom.

From Dauphin, Manitoba.—The correspondent forwarding this soil says: 'It is a sample from about 100 acres which is flooded with water for a considerable time each summer. It is covered with willow scrub and grass tall enough to cut for hay. The land can be drained at a reasonable expense, and I should like to know if it would make good wheat land when drained, as, if not, I would leave it for pasture.'

This soil is probably to be regarded as representative of those lands immediately surrounding the lakes and subject to more or less flooding during the early part of the season.

The soil as received is black loam, showing a few particles of marl. On drying, it cakes into somewhat hard masses.

ANALYSIS OF AIR-DRIED SOIL.

	Per cent.
Moisture	6·90
Clay and sand, &c. (including 54 per cent coarse sand)	64·09
Organic and volatile matter	10·65
Oxide of iron and alumina	12·00
Lime	1·76
Potash	·64
Phosphoric acid	·20
Nitrogen	·338

The following figures represent, approximately, the composition of the soil (air dried) as regards its chief constituents :—

Moisture	10·00
Organic (vegetable matter)	11·00
Clay and fine sand	22·00
Coarse sand	54·00
Carbonate of lime	3·00
	100·00

The soil showed no trace of acidity or sourness. Careful examination was made for 'alkali,' but with negative results. It is free from all soluble saline matter that would be injurious to crops.

It is evident from the above data that this soil is rich in all the essential elements of plant food; indeed, as regards nitrogen, phosphoric acid, potash and lime, it compares very favourably with soils of well recognised fertility. The proportions of clay, sand and organic matter are such, I believe, as would make it a fairly good wheat soil, though the percentage of clay is not as high as in the wheat soils of the Red River Valley. The, comparatively speaking, large amount of lime present would enhance its value for wheat growing. The mechanical condition of the soil is such as to indicate the necessity of thorough drainage. To bring the soil into condition it would, I think, be a wise plan to sow with oats or grasses for a year or two. This would improve the tilth and make the soil more suitable for wheat growing.

From Notre Dame, Kent Co., N. B.—Two soils sent by a correspondent, who writes concerning them as follows: 'I send you to-day samples of virgin and cultivated soils, marked No. 1 and No. 2, respectively. They are are taken according to your instructions and may be considered as representative, not only of the farm, but also of this district. The subsoil is heavy clay. Please advise as to crops and fertilizers.'

These are grayish-red loams in which sand predominates, of fair tilth, and showing some root fibres. There is but little difference in appearance between No. 1 and No. 2. The analytical data are as follows:—

ANALYSIS OF AIR-DRIED SOILS.

—	No. 1. Virgin soil.	No. 2. Cultivated soil.
Moisture	3·91	1·78
Organic and volatile matter	8·04	5·49
Clay and sand	73·17	81·51
Oxide of iron and Alumina	13·80	9·85
Lime	·89	·02
Potash	·51	·35
Phosphoric acid	·24	·12
Nitrogen	·158	·113

The most remarkable feature in the above results is that in all the essential constituents of plant growth—nitrogen, potash, phosphoric acid and lime—the cultivated soil shows percentages much smaller than those in the virgin soil. Since we must suppose, from the information furnished, that the cultivated soil was originally identical, or practically so, with the virgin soil, the analysis of which is here given, it is evident that great exhaustion of fertility has taken place, due, no doubt, to successive cropping without any adequate return of plant food. We have in these soils an important lesson most strikingly illustrated, and we commend the careful study of the above data to those interested in the question of soil impoverishment and improvement.

Again it is to be observed that the organic matter (humus) has also been much reduced by cultivation. This constituent, though not directly used as food by crops, is the natural storehouse and conservator of plant food, as well as the factor that regulates soil moisture and warmth, essential to crop growth. We have here, then, brought before us another way in which soils are seriously impaired by improper and injudicious farming.

The economic improvement of this soil would, necessarily, include, first, the application of organic manures. As in all probability there would not be sufficient barn-yard manure to bring up the land, recourse must be had to green-manuring, that is, the turning under of a growing crop, preferably clover. The crop from 8 to 10 pounds of clover seed (which may be sown with any of the cereals without diminishing the yield of grain) will, on ploughing under late in the autumn, enrich the soil to an extent equal in many respects to an application of 8 to 10 tons of ordinary barn-yard manure.

Secondly, an application of lime is needed, for the soil is deficient in this element. Twenty to forty bushels of lime per acre every fourth or fifth year would undoubtedly give a good return. If wood-ashes could be obtained at a reasonable price, they are to be preferred, since they furnish potash and phosphoric acid in addition to lime. As clover is a plant that more particularly responds to lime and potash, the benefit of such an application would first be to this crop, but as the turned under clover decays, these mineral constituents would be liberated for future use by the cereals, grass or roots, as the case might be.

THE ECONOMICAL IMPROVEMENT OF EXHAUSTED SOILS.

The examination of a, comparatively speaking, large number of cultivated or, more properly speaking, partially exhautsted, soils received from farmers during the past five

years has afforded the writer an excellent opportunity of ascertaining the chief deficiencies of such soils. Considerable experience has also been obtained indirectly regarding the economical renovation of these, for we have received the reports of many agriculturists who have carried out our suggestions respecting the treatment of such lands. It may not, therefore, be altogether uninteresting to our readers—especially to those in districts where it becomes a matter of necessity to clear up new land, in order to procure remunerative crops—if we place on record a brief statement regarding the conditions of these soils and the cheapest and most effective methods for reclaiming them and restoring them to their original virgin fertility.

These soils are of all classes, ranging from heavy plastic clays to light porous soils, and though these two types require somewhat different treatment, the effect of continued cropping without an adequate return of plant food has been found to be much the same in both. It will be in order, therefore, to first consider what the general results of an irrational method of farming have been and then to point out the remedial agencies that are to be used to make the soils once more productive.

Effect of Continuous Cropping Without the Application of Manure.—Every arable soil possesses its stores of plant food in what may be termed two forms—though there may not be any strong line of demarkation dividing them—inert or locked-up and available. The former is practically of no value to the growing crop (though by good culture its conversion into assimilable forms constantly takes place); the latter is in a condition to be immediately made use of by the plant and built up into its tissues, root, stem, leaf, and seed. Soils of low productiveness, but which originally gave paying crops, are those whose stores of available food have been drawn upon until but very small quantities remain. This we have proven by chemical analysis. One of the first mineral elements to show depletion is lime.

Again, on comparing the analyses of such soils, the fact is revealed that the vegetable matter or humus has, in a large measure, been dissipated or destroyed by cropping during a number of years, and that with the humus the nitrogen has also diminished. The importance of a due amount of humus is difficult to over estimate. Not that in itself it nourishes plants, but that it is the natural store-house which conserves plant food from waste, presenting it in compounds particularly acceptable for crop nutrition and use, and that it is the one great regulator of a soil's moisture and temperature.

We have already referred to the fact that the elements necessary for plant nutrition are present in soils in two conditions, as it were; for the most part, in insoluble inert forms, but also, to a small degree in combinations soluble in water or readily dissolved by the slightly acid exudations of rootlets, and hence at once useable by plants. Recent research in the chemistry of soils goes to show that the basic humates, i.e., the mineral elements found in combination or connection with the soil humus, furnish more particularly this available plant food. As the humus decreases we are to understand then that as a general rule not only the percentage of nitrogen decreases, but also that the percentages of available phosphoric acid, potash and lime decrease.

Since the difference between a small yield and a large one is frequently a matter of water supply only, it is apparent that a consideration of that agency which tends to its preservation in proportions best suited for plant growth is worthy of our most serious attention. Neither clays nor sands, unless duly provided with vegetable matter, can withstand seasons of drought; the first has shed the rain as surface water; the latter, has allowed it to drain through and out of the reach of the crop's roots. Semi-decayed vegetable matter, by rendering heavy loams more porous, renders them pervious to the falling rain and melting snow, and then by its absorptive qualities serves to retain this water for crop use. In light soils, this latter property is brought prominently into play, rendering them able to support and nourish a crop otherwise quite impossible in dry seasons.

In addition to its useful function in retaining moisture, humus has a most beneficial effect upon a soil's texture, rendering clay loams more friable and mellow and allowing air (which is as necessary for the life of roots as water or food) to freely per-

meate their mass. It also serves to compact and otherwise improve the physical or mechanical condition of light and sandy soils. Without extensive root development there cannot be an abundant production of stem, foliage and seed; this is only possible in a soil with fair mechanical condition, one in which the roots can freely forage for their food.

Before leaving this brief review of the part that humus plays as a soil constituent, we must refer to the useful purpose it serves in furnishing food for bacteria or germs, microscopic plants, which live in myriads in all fertile, aerated, moist and warm soils, and which among other functions perform a most valuable work in converting nitrogenous organic compounds into nitrates, the only form, as far as we know, in which farm crops, other than legumes, can obtain the nitrogen necessary for their growth. We must also suppose that these germs serve in some degree towards the predigestion of the mineral constituents of humus, thus preparing them for assimilation by plants of a higher order. This seems evident from the fact already mentioned, that the percentages of mineral humates largely indicate a soil's fertility.

To sum up, we shall narrate briefly the features that characterize partially exhausted soils and those of low productive power, and give some of the more important economic means whereby such soils may be improved.

1. *Poor Texture.*—Better and more careful and thorough tillage is required to render them friable, porous and mellow. If a heavy clay loam, drainage will be found necessary, indeed essential. This is the true and only remedy for heavy, wet and sour lands and those underlaid by a hard and impervious subsoil. Drainage deepens the surface soil by lowering the water level, and thus allows the roots an opportunity to seek their nourishment at greater depths than is possible in a water-soaked soil. It allows a soil to become aerated, a condition essential to the welfare of living roots. Drained soils are moister in dry seasons and drier in wet weather than those undrained. Occasional subsoiling, which is simply a loosening of the layer immediately beneath the surface soil, will be found of great value to soils underlaid by hardpan.

Thoroughness in working a soil is also of great value in promoting tilth or good texture. A hard, cloddy soil is an uncongenial medium for the growth of farm crops. Clay soils should not be worked while wet, if possible, for such tends to puddling and plasticity, destroying their porosity and drainage power.

2. *Deficiency of Humus and Nitrogen.*—We may take it for granted that a lack or abundance of the former means a lack or abundance of the latter. Constant working and cropping must diminish the stores of these valuable constituents, making it absolutely necessary that all lands (save, perhaps, those in pasture) should from time to time receive an application of a nitrogenous organic fertilizer, if fertility is to be maintained.

Naturally, the manure from farm animals takes precedence as a source of organic matter and nitrogen. Unfortunately, on many farms, there is not sufficient produced to keep all the land in good heart. A very grave mistake has been made by many farmers in this respect, which must be rectified if the soil is to be brought again to its original productiveness. Dairying and stock raising if more generally practised would soon have their effect upon the soil. It has been the continuous growing of grain crops and potatoes and the selling of these products to the exclusion of other branches of farming that has caused the impoverishment of much of our arable land in the older provinces of the Dominion.

Possibly a worse feature than the deficiency of manure is the waste of it that ensues on so many farms. First, there is the loss by drainage of much of the liquid portion in the stable, cow house, and pig pen, and then follows leaching and excessive fermentation in the barn-yard. We do not hesitate to say that losses from these causes frequently amount to from one-third to one-half, or even more, of the original value of the manure. The solid and liquid portions together, as voided, would contain approximately three-fourths of the plant food present in the feeds used, the liquid part containing practically all the immediately available constituents, and hence by far, the more valuable. It, therefore, behooves every farmer to see that the floors of the buildings in which animals are kept are sound and water-tight and that sufficient bedding is used to soak up and

retain the liquids. In this connection, we would make two suggestions. The first is to cut the straw used for litter, and thus increase its absorbent power; the second is, to use in addition to the straw bedding in the cow house and piggery, a certain quantity of air-dried weathered muck, when such material can be readily obtained, as is frequently the case. Muck not only contains a considerable amount of plant food, especially nitrogen, which is set free by the subsequent fermentation in the manure pile, but by its great absorbent powers retains and saves from loss, as we have pointed out, the most valuable part of the manure. Air-dried muck frequently contains 75 per cent or more of vegetable matter. This by composting is converted into humus-like compounds and hence it is obvious that the employment of this naturally-occurring fertilizer in such a way as we have outlined is particularly valuable for such lands as we are now discussing.

A further important source of humus and nitrogen is green manuring; that is, the turning under of a green crop. For this purpose, we advocate especially the legumes, since they alone have the power (through the agency of certain germs that reside in the nodules on the roots) to assimilate free nitrogen from the air, thus enriching the soil with the most costly of all forms of plant food from a source otherwise unavailable. A good crop of Red or Mammoth clover turned under will furnish as much nitrogen to a soil per acre as a dressing of 8 to 10 tons of ordinary barn-yard manure. The benefits of this method of manuring (which indeed are hard to over-estimate) are stated at length in the report of this Division for 1895. On soils too poor to grow clover, a beginning must be made with buckwheat or rye. These crops ploughed under for a year or two and the soil further enriched with a dressing of wood-ashes (or a fertilizer supplying potash, phosphoric acid and lime) will be all that is necessary to furnish a condition suitable for the growth of clover.

3. *Sourness and Deficiency of Lime*—Since the former is often the result of the latter, it naturally follows that these conditions are frequently found in the same soil. It is also obvious that improving the soil as regards its lime content at the same time corrects sourness. Acidity or sourness is inimical to crop growth; deficiency in lime means not only the lack of an element necessary for plant nutrition, but also an unfavourable condition for nitrification of the humus.

We have in past reports explained at length the many valuable functions—chemical and physical—which lime performs in the soil. It will, therefore, be only necessary to here indicate how the farmer may obtain an indication of the amount of lime in a soil, and enumerate the sources which he can draw upon to furnish this element.

To ascertain if a soil is sour or deficient in lime, put a few ounces of it in a tumbler and add approximately an equal quantity of water; stir well and allow to settle. Place a small piece of blue litmus paper (obtained very cheaply at any druggist) in the supernatant water for a few moments. If, on withdrawing it and allowing it to dry, it is noticed that the blue color has been changed to red, the soil is sour. (The change of colour will be the best noticed if only one-half of the slip of litmus paper has been immersed.) Now add a tablespoonful of strong vinegar to the soil and water in the tumbler. The absence of effervescence or very slight effervescence only will indicate a deficiency of available lime.

To supply lime and at the same time to correct sourness, 20 to 40 bushels of lime per acre may be used. After being allowed to air-slack in small earth-covered heaps upon the field, it should be thoroughly incorporated with the surface soil by shallow ploughing or harrowing, or simply the latter, if the lime has been applied to the ploughed field. Lime has a tendency to work down, so should never be deeply ploughed under.

Marl is a very valuable source of lime for agricultural purposes. It may be frequently found in beds underlying deposits of swamp muck. It is much more 'mild' and slower in its action than lime, and can be applied in quantities much in excess of those given for lime, without injury to the soil.

Wood-ashes, in addition to 5 to 6 per cent of potash and 1 to 3 per cent of phosphoric acid, furnish lime to the extent of 30 to 35 per cent. It is obvious, therefore, that in them we have a very complete fertilizer for supplying mineral plant food. It is

a mistaken policy on the part of the farmer, we have always held, to sell wood-ashes, which really represent fertility from his soil, for such a paltry recompense as he usually obtains from ash collectors. By reason of the potash and lime they contain, wood-ashes are of particular value for encouraging the growth of clover—and a rotted clover sod is an excellent preparation for a crop of corn, roots or cereals. An average dressing of wood-ashes might be placed at 50 bushels per acre, though, if the supply be limited, half that quantity would undoubtedly show good results on such soils as we are now considering, namely, those that are sour or deficient in lime.

FERTILIZERS AND AMENDMENTS.

MARSH MUD.

A sample of this material from the Habitant River, Cornwallis Valley, N.S., has recently been examined at the request of the Hon. F. A. Borden. The data obtained are tabulated as follows :—

Analysis of Marsh Mud (Air-dried.)

Moisture	3·45
Organic and volatile matter	4·14
Clay and sand	75·59
Oxide of iron and alumina	11·71
Lime	1·40
Magnesia	·48
Common salt (sodium chloride)	·86
Total phosphoric acid	·15
Available phosphoric acid	·05
Total potash	·25
Available potash	·06
Nitrogen	·128

In all essential features, this marsh mud or deposit resembles closely many samples from the Bay of Fundy, previously examined in our laboratories. Though doubtless a material that might improve many soils, it cannot be regarded in the same light as a commercial fertilizer, for its percentages of essential elements of fertility—nitrogen, potash and phosphoric acid—are not large; indeed a careful comparison reveals that, as regards composition, this deposit is not richer than many soils of average productiveness.

Important features in the above analysis are the determinations of *available* potash and phosphoric acid. We have for a long time been led to think that the greater part of the benefit accruing from the use of these deposits might be due to a comparatively high availability of the mineral plant food, since, as we have already seen, the total amount of such is by no means large. Accordingly, this sample was examined by the Dyer method (see report of this Division for 1897, page 158), and as a result the percentages of 'available' phosphoric acid and potash above recorded were obtained. Though these percentages, from the ordinary point of view, would be considered small, it is to be remarked that, compared with similar data from good, fertile soils, they are remarkably large. Thus, compared with a rich soil from British Columbia, we have the following :—

—	Soil from British Columbia.	Marsh Mud, Cornwallis, N.S.
Potash	·23	·25
Available potash	·005	·06
Percentage of total potash available for plant use	2·2	24.00
Total phosphoric acid	·19	·15
Available phosphoric acid	·010	·05
Percentage of total phosphoric acid available for plant use	5·66	33·33

There results verify our conjecture and show that a very large proportion of the potash and phosphoric acid is present in a condition at once useable by crops. If an application equivalent to 100 tons of the air-dried material per acre were made, there would be furnished to that area, approximately, 120 pounds potash and 100 pounds phosphoric acid immediately available for plant use—no inconsiderable amounts.

Further, in all probability, much of the benefit that is derived from this material is due to its mechanical effect upon the soil. As these deposits vary in their proportions of sand and clay, their results will depend much upon the nature of the soils to which they are applied. It thus may happen that the frequent application of a 'mud' rich in clay may do positive harm to a heavy soil, destroying its tilth; while the same material on a light soil would give excellent results, and vice versa. Close observation on the part of the farmer is needed in this matter.

The common salt present is of no direct value as plant food, but serves, undoubtedly, in the liberation of inert or locked-up plant food, especially lime and potash, in the soil. It is for this reason that the continued use of salt muds exhausts, rather than enriches, the soil in these elements, and the necessity of supplementary manures is made obvious.

It is also probable that soils frequently 'mudded' become comparatively poor in humus, and consequently in nitrogen, a condition that always reduces productiveness. For this reason, a certain amount of an organic manure, such as would be supplied by barn-yard manure, should be applied in conjunction with the mud.

A consideration of these facts, therefore, while leading us to acknowledge and recognize the value of marsh mud, at the same time urges its judicious and intelligent use, and in conjunction with other forms of plant food. Too many have erred in its indiscriminate application, under the impression that it was a complete fertilizer, and could be used in any quantity without endangering the condition of the soil.

Through the kindness of Professor Wm. F. Ganong, Smith's College, Northampton, Mass., who is at present engaged in an exhaustive study of these deposits with a view of determining the relation between their composition and flora, I am enabled to present the following data obtained from a mechanical examination of the soil. My thanks are also due to Dr. G. E. Stone, Agricultural College, Amherst, Mass., under whose direction the analysis was made.

Mechanical analysis of the sample of Cornwallis Soil.

Water	3·400
1. Organic matter	3·200
2. Gravels from 2· to 1· mm. diam	·125
3. Coarse sand, from 1· " ·5 " "	·260
4. Medium sand " ·5 " ·25 " "	1·485
5. Fine " " ·25 " ·1 " "	4·060
6. Very fine " " .1 " ·05 " "	46·010
7. Silt " ·05 " ·01 " "	26·800
8. Fine silt " ·01 " .005 " "	8·710
9. Clay " ·005 " ·0001 " "	5·825
	99·875

SWAMP MUCK.

In the subjoined table we give the analytical data obtained from the examination of certain samples of swamp muck received from farmers during the past year.

As in former reports (1894 and 1896) we have written upon this subject at length, stating the origin, composition and uses of this and allied materials, it will only be necessary here to remind our readers that while crude muck applied directly to the land is of but little manurial value, its plant food can be made available by composting, as with barn-yard manure; and, further, that as an absorbent in and about the farm buildings, indeed, wherever there is liquid manure likely to go to waste, it can be employed to

advantage. As a manure, its chief value lies in the humus and nitrogen it contains. The amounts of these constitutents, considered in connection with the degree of decomposition of the muck, therefore, determine the relative value of any particular sample.

ANALYSIS of Swamp Muck (air-dried), 1899.

No.	Locality.	Sender.	Nitrogen. Per cent.	Nitrogen. Pounds in one ton of material, air-dried.	Organic and volatile matter.	Sand and clay.	Mineral matters soluble in acid.	Water.
1	Carleton, Lot 28, P.E.I	W. S. Muttart....	2·63	52·6	79·23	1·38	6·32	13·07
2	Charnwood "	W. A. Leslie......	1·295	25·9	84·02	3·44	2·75	9·72
3	Bonshaw "	J. B. Crosby	1·57	31·4	54·05	20·32	10·60	15·03
4	Bedeque "	Chas. D. Wright..	1·78	35·6	56·09	16·68	7 26	19·97
5	Newcombe, Lunenburg Co., N.S., No. 1.	Henry West......	1·16	23·2	84·65	·57	1·06	13·72
6	Newcombe, Lunenburg Co., N.S., No. 2.	"	1·10	22·0	86·48	·54	1·16	11·82
7	Lower Cariboo River, N.S...	D. B. Gray.......	·694	13·8	30·96	44·75	16·64	7·65
8	Bathurst Village, N.B.......	Angus Kenny, No. 1	·806	16·2	23·33	54·20	14·75	7·72
9	" "	" No. 2	1·15	23·0	34·90	34·22	10·31	20·57
10	" "	B. J. Power	1·55	31·0	72·95	3·98	9·56	13·50
11	St. Stephens "	E. H. Barter	1·534	30·6	77·01	7·14	5·31	10·54
12	Clarendon Station "	H. W. Roberts....	1·59	31·8	69·85	7·79	11·37	10·99
13	Chatham "	Geo. E. Fisher....	2·33	46·6	69·70	2·21	18·33	9·76
14	Aylmer, Que., No. 1.........	J. A. Fulford.....	2·136	42·7	60·00	12·94	13·00	14·06
15	" No. 2.........	"	1·81	36·2	48·25	10·52	30·37	10·86
16	Chateauguay Basin, Q., No. 1	R. Jack & Son....	1·75	35·0	57·30	16·30	11·64	14·76
17	" " No. 2	"	1·79	35·8	74·59	·81	10·87	13·78
18	St. Raymond, Que..........	J. P. Cantin......	·444	8·8	13·24	72·53	10·25	3·98
19	Hermanville "	J. D. McIsaac....	1·059	21·2	34·65	28·88	16·73	19·74

Brief notes on the above may be given as follows :—

No. 1. 'From a swamp from 5 to 6 acres in extent, ranging 1 to 6 feet in depth, thinly covered with stunted growth of juniper, spruce, fir, ash and swamp maple, with an undergrowth of alder bushes, ferns and tall grasses.'

An excellent sample, being composed almost entirely of semi-decomposed vegetable matter, and containing above the average per cent of nitrogen, would prove valuable for composting, and also as an absorbent.

No. 2. "Occurs in a dip or basin about half an acre in extent, depth of deposit from 6 inches at edge to 3¼ feet in middle. Surface covered with undergrowth."

Not very well decomposed, but practically free from clay, sand, &c. As regards nitrogen, it is of average quality. Would make a useful absorbent.

No. 3. While not the equal in quality of the best samples, it is of sufficient value to use. It should, however, be thoroughly composted before being applied to the soil.

No. 4. Of fair average quality, and should prove a useful source of humus and nitrogen, after being thoroughly composted.

Nos. 5 and 6. 'From a large bog within a mile of several farms. Deposit is many feet deep.' A very good muck, though not above the average in nitrogen. It is practically free from inert matter. It requires weathering and fermentation, and then would prove a useful manure. Could be used in air-dried condition as an absorbent in and about the farm buildings. Samples are practically identical.

No. 7. 'From below a deposit of muck.' Not equal in quality to ordinary swamp muck, and it would be better to use the overlying deposit, since the latter would be richer in vegetable matter and nitrogen.

No. 8. 'From an old beaver pond; deposit 6 to 9 feet deep. Taken 8 feet below surface.'

No. 9. From the same deposit, taken 2 feet below surface. No. 9 is the better sample, being richer in nitrogen and organic matter, and containing less clay.

No. 10. A fair muck of average quality. Requires thorough fermentation by composting, according to one or other of the methods given in previous reports.

No. 11. Woody in character and but little decayed. Practically of no manurial value in its present condition, but could be used probably to advantage after air-drying as an absorbent of liquid manure.

No. 12. Slightly above the average.

No. 13. 'From a deposit overgrown with cedars, birch and spruce, varying in depth from 3 to 4 feet.' An excellent muck, rich in organic matter and nitrogen and practically free from sand and clay. It, however, requires weathering and composting before it will furnish its plant food in available forms. Air-dried, it should act as a good absorbent.

Nos. 14 and 15. 'From upper and lower layers, respectively, of desposit.' Both are fair samples, but the upper (No. 14.) is somewhat the better of the two.

Nos. 16 and 17. 'Apparently from an old river or lake bed, the deposit lying between hills, and varying from 150 feet to 1,000 feet in width. About 9 feet deep and underlaid with shell marl." As a soil, No. 16 would probably give better results. It should be well drained and treated with lime, or better still, with wood-ashes at the rate of 50 to 75 bushels per acre. This would correct sourness and supply the necessary mineral constituents, and make it a good soil for market garden stuff. A dressing of good barn-yard manure at the outset would be valuable in starting decomposition and furnishing immediately available plant food.

As an absorbent and material for composting, No. 17 is to be preferred.

No. 18. This is not, properly speaking, a swamp muck, but is rather of the nature of a soil rich in organic (vegetable) matter. Of very little, if any, value as an absorbent.

No. 19. This is not equal to the best samples, but worth composting, if the soil of the farm stands in need of humus.

TANNERY ASHES.

Numerous inquiries have from time to time been received as to the value of ashes from tanneries as a fertilizer. As we had no definite information on this matter, we determined to submit to for analysis two samples of such ashes forwarded by a correspondent in Orillia—one, collected directly from the furance ; the other, taken from a heap of the exposed ashes. The fuel producing these ashes is stated as "spent tan bark and a few pine slabs.' Our results are as follows :—

Analysis of Tannery Ashes.

———	From Furnace.	From Heap.
Moisture	0·24	40·32
Loss on ignition (charcoal, &c.)	5·30	4·30
Insoluble mineral matter	6·95	3·76
Phosphoric acid	2·13	1·00
Potash	3·05	·98

The presence of a large percentage of water in the exposed ashes and the evident fact that they had suffered considerable loss through leaching, makes them much less valuable, weight for weight, than the ashes taken at once from the furnace. The latter practically contain one-half the amount of potash found in good unleached wood-ashes, and consequently may be considered as worth approximately half the price of this well known potassic fertilizer. Like wood-ashes, these tannery ashes possess a certain well marked agricultural value for the lime and phosphoric acid they contain.

WOOD-ASHES.

The analysis of a sample of wood-ashes forwarded by Messrs. Reford & Co., Montreal, showed their composition to be as follows :—

	Per cent.
Moisture	2·26
Loss on ignition (charcoal, &c.)	5·62
Insoluble matter (clay, sand, &c	17·36
Phosphoric acid	2·21
Potash	6·22

Commercial wood-ashes necessarily vary somewhat in composition; but good samples should range between 5% and 6% potash, and 1·5 per cent to 2·5 per cent phosphoric acid. It is evident, therefore, that this sample may be regarded as quite equal to the standard of good commercial grades.

FISH POMACE.

The value of fish waste as a supplier of nitrogen and phosphoric acid has been set forth in previous reports of this division (see report for 1896). In the early part of the present year a further sample was analysed in our laboratories. This was forwarded by Mr. H. D'Almaine, farm superintendent for Sir Wm. Van Horne at St. Andrews, N.B., and had been prepared from herring, quantities of which at certain times in the year, I understand, can only be used in the preparation of fertilizer.

Our analysis furnished the following results ·

	Per Cent.
Moisture	40·23
Organic and volatile matter	46·68
Mineral matter	13·09
	100·00

	Per Cent.	Lbs. per ton.
Phosphoric acid	2·39	47·8
Nitrogen	5·99	119·8

Assigning to nitrogen and phosphoric acid the values of 10 cents per lb. and 5 cents per lb., respectively, a moderate valuation, this fertilizer would be worth $14.37 per ton.

Farmers along the coast of the maritime provinces in many places could obtain fish offal for the hauling, and it seems a great pity they do not make more use of what might easily be converted into a most valuable manure. To furnish information regarding the preparation of such a fertilizer, the following account has been written. There is much land, especially in Cape Breton, that might with advantage receive a dressing of a manure supplying organic matter in addition to the elements of fertility, and it is hoped that the subjoined information will lead many to secure this valuable material which, for the most part, is now wasted and, indeed, frequently, as in the neighbourhood of fishing stations, &c., proves a nuisance and a menace to health.

Preparation of fish waste upon the farm.—Some method of composting must be followed, since the artificial drying of the fish or offal and extraction of fat resorted to by the fertilizer manufacturers are too costly for the farmer. If swamp muck exists in the neighbourhood, no better composting substance could be used. After being dug and piled, it should be allowed to thoroughly air-dry and weather. If, however, muck is not accessible, good loam will answer. The compost heap should be made of alternate layers (3 to 6 inches thick) of the fish waste and muck, a layer of the latter being uppermost. Sprinkle each layer of fish offal with quick lime or wood-ashes. A convenient height for the compost heap is from 4 to 5 feet and it is advisable to protect it from rain

with a rough roof of boards, and thus prevent leaching. The heap should be turned over once or twice to check excessive fermentation and to make the mass uniform. If during the fermentation the composting mass becomes dry, it should be moistened. Composts should be kept damp, but not saturated with water. The length of time to bring the whole mass into fine condition will depend much upon the weather; if the compost is made in summer, probably three to four months will suffice.

In order that this fish compost may supply all three of the chief elements of plant food, we counsel the addition of wood-ashes (to furnish potash) at the rate of 200 lbs. per 500 lbs. of fish, before composting. If wood-ashes are not obtainable, kainit (a German potash salt containing 12 to 13 per cent potash) at the rate of 100 lbs. per 500 lbs. fish waste, can be used.

Method used in France.—It has for many years been a common practice in France to preserve fish waste by the use of quick-lime. The fish offal and quick-lime are placed in alternate layers in a hogshead or other suitable receptacle. The moisture of the fish slakes the lime and a so-called albuminate of lime is formed. After a few weeks, the mass is thoroughly turned over and mixed, and spread in thin layers to dry. The resulting material can be kept without offence for a long time if preserved in a dry place. If dry, unleached wood-ashes were used (replacing half the amount of quick-lime) or kainit added in the proportion already indicated, the resulting manure would be rich in potash as well as in nitrogen and phosphoric acid.

Since fish compost readily yields its elements to growing crops, it may be applied in the spring. It should be harrowed in, or at most but slightly turned under. Its best results are obtained on medium soils; that is, those that are characterized as neither too light nor too heavy.

THE FERTILIZING VALUE OF SLUDGE AND POUDRETTE.

In the various systems of sewage purification by precipitation adopted by cities, a product is obtained from the settling vats or reservoirs which is generally known as sludge. The composition of this material will, naturally, vary with the concentration of the sewage, the nature and amouunt of the precipitant (lime, alum, &c.,) and the degree to which it is subsequently dried; hence, the fertilizing value is a matter of close inquiry. For want of correct information, we fear this value is frequently exaggerated, and we accordingly insert the following data obtained in our laboratories this year from a sample forwarded from Hamilton, Ontario. The analysis was made at the request of several large fruit growers in the Niagara district, who had been purchasing or who were considering the purchase of this fertilizer for their vineyards and orchards.

Sludge from Hamilton Sewage Disposal Co.

	Per Cent.
Moisture	31·75
Organic and volatile matter	39·05
Mineral matter	39·20
	100·00
Clay, sand, &c., insoluble in acid	9·66
Alumina (plus small amount of oxide of iron)	4·74
Lime (CaO)	9·23
Magnesia (MgO)	10.40
Phosphoric acid (P_2O_5)	·69
Potash (K_2O)	·19
Nitrogen	·84

Comparing these figures with those recorded in England and Germany for similar materials, the quality of this sludge appears to be somewhat above the average; the

percentages of the essential elements of fertility, it will be seen, however, do not approximate those found in commercial fertilizers, nor can we suppose the plant food in sludge to be as available as in the latter. It is quite evident that these facts, apart from other considerations, would not permit its transportation to any great distance with profit; but, providing it does not affect injuriously the condition of the soil, that it could be got cheaply, and that it was supplemented with other manures (more especially those containing potash), it could be used locally to advantage.

A feature worthy of notice to those whose soils are deficient in lime, is the comparatively large amount of this element present in this sludge, the greater part of which exists in the fresh material as slaked lime, but which becomes converted into the form of carbonate of lime by long exposure.

Unless sludge is thoroughly weathered, as by exposure throughout the winter, it is refractory and not easily incorporated with the soil. This is a serious objection to its general use. Again, heavy clay loams might be injured by a continued use of such a plastic, mud-like material, and we could, therefore, only advise its trial upon sands or gravels, especially those in need of lime and organic matter.

The term poudrette is applied to the dry, powdered sludge, a material usually of greater manurial value than sewage, by reason of its containing somewhat larger amounts of plant food, and being in a better mechanical condition. A sample received from Toronto a few years ago, the product of a process under trial there, furnished the following data:—

Poudrette from Toronto.

	Per cent.
Moisture	3·94
Organic and volatile matter	40·91
Mineral matter	55·15
	100·00
Clay, sand, &c., insoluble in acid	34·05
Oxide of iron and alumina	13·65
Lime (CaO)	2·07
Magnesia (MgO)	·33
Phosphoric acid (P_2O_5)	1·24
Potash (K_2O)	·21
Nitrogen	2·04

As analysed, this poudrette is considerably richer in plant food than the sludge, due chiefly to the smaller quantity of water it contains.

Sludge and poudrette are said to be rich in germs of the nitric ferment, which are necessary for the conversion of soil nitrogen into nitrates, the form in which farm crops obtain their supply of this element. It is probable that the beneficial result from the use of these materials is in part due to the presence of these nitrifying germs.

FODDERS AND FEEDING STUFFS.

BROAD LEAF HAY *(Spartina Cynosuroides.)*

In Bulletin No. 19, issued in 1893, we published data showing the composition of broad-leaf hay from grass obtained at Indian Head, N.W.T., Brandon, Man., and Sackville, N.B. The latter sample was so decidedly inferior to the others that it was thought well to repeat the analysis on another sample from the maritime provinces, and thus learn if that sent in 1893 had been cut too late for best results. We accordingly examined, during the early part of the year, a sample kindly furnished by Mr. Jas. Frier, of Shediac, N.B. The results are given in the following table, which also con-

tains, for the purpose of comparison, analyses made of timothy hay and brome grass hay of the 1897 crop on the Central Experimental Farm, Ottawa:

Constituents.	Broad-leaf Hay.	Timothy Hay.	Brome Grass Hay.
Moisture	7·00	9·72	10·76
Protein or albuminoids	4·95	5·94	6·61
Fat	3·73	5·38	4·51
Carbo-hydrates	47·87	43·25	41·01
Fibre	30·82	31·30	31·86
Ash	5·73	4·41	5·25

As regards the most important constituents—the albuminoids (sometimes called flesh formers),—broad-leaf hay is seen to fall considerably behind timothy and brome grass hay. From experiments made in the United States it appears that the digestibility of broad-leaf hay is not quite equal to that of either timothy or brome grass (cut under the same conditions) and, therefore, I think we are quite justified in placing its feeding value lower—probably 15 to 20 per cent—than that of timothy hay and brome grass hay. From our experience in the matter of grasses and their nutritive qualities, we are of the opinion that a much more nutritious hay could be obtained by cutting the broad-leaf earlier in the season than is now customary.

HAY DECOCTION OR TEA.

A correspondent in Sackville, N.B., wrote us in March last as follows: 'We have more hay here than we can sell or get stock to feed to in the ordinary way. It occurred to me that by steeping it we might get the most of the nutriment, leaving the woody portion for compost, the decoction being good for hogs and other stock. The sample I send herewith has been prepared by steeping 16 pounds of hay in about 70 pounds of hot water, the weight of the resulting decoction was 67 pounds, the difference being lost by evaporation. I should like to know its feeding value and if it could be used with economy for stock.'

The analysis of the hay decoction furnished the following data:—

	Per cent.	Per Gallon.
Total solids or extractive matter	2·06	3½ ozs.
Nitrogenous matter or portein	·48	¾ "
Mineral matter or ash	·33	½ "

The total weight of the decoction, 67 pounds (obtained from 16 pounds of hay) would therefore, contain:—

	Pounds.	Ounces.
Total solids or extractive matter	1	6
Nitrogenous matter		5
Mineral matter or ash		3½

The use of hay tea, supplemented by a little linseed and shorts, has enabled many farmers to raise calves successfully without whole milk, but the data here presented make it extremely doubtful if such a decoction as the above contains sufficient nourishment to make its preparation profitable for adult stock or swine. It could, of course, be concentrated by simply boiling down, but whether this could be done with profit would depend largely on the price of fuel and labour. We are inclined to think that as far as dairy and fattening cattle are concerned it would pay better to feed the hay, provided it is of good quality and has been cut early i.e., before the ripening process had set in.

COTTON SEED MEAL.

This concentrated feed stuff is imported from the United States, where it occurs as a by-product in the cotton industry of the south. The hulls or envelopes of the cotton seed being removed, the kernels (which are rich in oil of considerable commercial value) are crushed and subjected to heat and pressure. By this means the greater part of the oil is separated, a residue being left, which is either sold as it comes from the mill—cotton-oil cake— or ground and shipped as cotton seed meal.

This material, recognized as a most valuable feeding stuff, by reason of its high percentage of protein (albuminoids) and its notable amount of oil or fat, is now being extensively used in certain dairying and stock raising districts of the Dominion to furnish a part of the ration. On account of its exceedingly concentrated character, and possibly the presence of some active principle not as yet isolated or determined, cotton seed meal must be used judiciously, that is, in reasonable amounts and with other feeds. Professor Henry, of the Wisconsin experiment station, in his work 'Feeds and Feeding', says that it has been fed with safety and profit to dairy cows to the extent of 5 to 6 pounds daily per head; however, such quantities are not to be generally advised, 2 pounds being probably a safe limit. For fattening steers the amount, it is stated, can be gradually increased to 6 pounds, or even more, per head, daily, though it is generally admitted that good health and thrift demand a mixture of grains or concentrated feeds—which necessarily means a less weight of cotton seed meal than that here mentioned. To those beginning the use of this feed, we would counsel carefulness, employing it at first in small amounts and always mixed with a good proportion of other feeds.

Repeated trials have shown that cotton seed meal cannot be fed to calves. It invariably, even when fed to the extent of a few ounces daily, causes an acute form of indigestion followed by diarrhœa, and is usually followed by death. Neither is it a safe or profitable feeding stuff for swine.

A sample forwarded from Dalling, Que., during the past year afforded the following data :—

Cotton Seed Meal.

Moisture	6·17
Fat or oil	8·72
Protein or albuminoids	43·19
Fibre	5·88
Carbo-hydrates	28·36
Ash or mineral matter	7·68
	100·00

The average composition of cotton seed meal as given by American authorities, is :

Moisture	8·2
Fat or oil	13·1
Protein or albuminoids	42·3
Fibre	5·6
Carbo-hydrates	23·6
Ash or mineral matter	7·2
	100·00

The only difference of note between the two is the much smaller percentage of fat in the sample analysed, evidently due to a larger proportion of the original oil being expressed than is usually the case. The deficiency in fat is to a certain extent counter balanced by slightly increased percentages of protein and carbo-hydrates.

Since inquiries are being frequently received respecting the comparative values of the more concentrated feed stuffs, we append for the information of our readers the following table, gathered from American sources, from which may be learnt the percentages of the digestible nutrients they contain :—

DIGESTIBLE Nutrients in 100 lbs. of certain concentrated feed stuffs.

——	Protein.	Fat.	Carbo-hydrates.
Oil cake (new process)	28·2	2·8	40·1
Oil cake (old process)	29·3	7·0	32·7
Bran	12·2	2·7	39·2
Cotton seed meal	37·2	12·2	16·9
Gluten meal	25·8	11·0	43·3
Pea meal	16·8	·7	51·8

If we assume that the ratio of value between digestible protein, fat and carbohydrates, to be as 3:3:1—a ratio which necessarily must be considered as only approximately correct—we ascertain the comparative feeding values of the above feeds to be as follows :—

	Approximate Feeding Values.
Oil cake (new process)	133
Oil cake (old process)	141
Bran	84
Cotton seed meal	165
Pease	104
Gluten meal	154

That is, if judiciously and rationally used, pease would be approximately worth for their nutrients $1.04 per cwt., when bran sold for 84 cents per cwt., and so on.

LAMBS' QUARTERS (*Chenopodium album*).

This weed is abundantly prevalent in Manitoba and the North-west Territories, Dr. Fletcher considering it the most common of all the weeds in those provinces. Since in many parts it has spread so as to entirely cover comparatively large tracts of land, we considered it advisable some years ago to determine its value as a fodder plant, as well as its manurial worth. An account giving the analytical data on these points was published in our report for 1890, from which we may briefly quote as follows :— 'Judging from its composition and relationship to other edible plants, there seems no reason why it (Lambs' quarters) should not make a nutritive fodder if cut young and in a succulent condition. As the plant matures there appears to be a considerable deposition of woody fibre, which would lower its digestibility considerably.' Respecting its fertilizing value or, looked at from another standpoint, the extent to which it exhausts the land, we showed that in the fresh condition one ton of the plant contained nitrogen, potash and phosphoric acid worth $2.74, and that of these three elements potash was the most abundant, practically one-half of the ash consisting of this constituent.

In the early part of the present year several samples of the seed of this weed were received from Manitoba, the letters accompanying these requesting information as to its feeding value. Thus, Mr. Thos Dand, C.E., crop correspondent, writing from Delor-

aine, says: 'We have a very large quantity of small seed this year as a residue from thrashing. This weed is on our best new cultivated land and must have been brought here in the winter by snow storms and blizzards. This district has grown at all times the very best 'No. 1 Hard' since 1886. The sample of seed goes to you by this mail and our farmers, since many of them have a large quantity of it, would be glad to have you make an analysis.'

Again, Mr. S. W. Bishop, of Sintaluta, writes under date of December 30, 1898 'I send you a small bag of the seed of pigweed or lambs' quarters, of which we have a large pile at each thrashing. This I have saved and fed to my cattle, 1 gallon each per day, and they seem to eat it readily and with relish. Will you kindly let me know its feeding value, and if it is worth saving as feed?'

We, accordingly submitted the seed to analysis, and obtained the following data:—

Analysis of Seed of Lambs' Quarters (Chenopodium album).

Moisture	9·82
Fat or oil	6·78
Protein or albuminoids	14·19
Fibre	1·27
Carbo-hydrates	63·91
Ash or mineral matter	4·03
	100·00

From these results, I judge the seed to have a comparatively high feeding value. Its percentages of fat and protein—the two most important nutrients—place it approximately, midway between corn meal and bran.

Since these seeds are very small and possess a hard integument, it seems most probable that if fed without previous grinding or boiling the greater number of them would pass through the animal undigested, in which case not only would they be of no food value, but harm would be done by their dissemination over the farm in the resulting manure.

THE CHEMISTRY OF INSECTICIDES.

PARAGRENE.

In the early months of the present year our attention was called by several large fruit growers to a newly introduced insecticide, Paragrene, a material which the manufacturers claim is fully as effective as Paris green and much cheaper.

In a letter received from the manufacturer, Mr. Fred. L. Lavenbury, New York, U.S., under date of March 31, he writes to Dr. Fletcher: 'In answer to your kind inquiry we inclose circular describing Paragrene as an insecticide. We claim that it contains 50 per cent arsenious acid, thus making it absolutely reliable and effective as a poison. It is to be used in exactly the same way and in the same quantities as Paris green. Respecting price, we have adopted a price list for the consumer which makes it impossible for the article to cost more than 14½ cents per pound for 14 pound pails; 15 cents for one and three pound packages; and 16 cents for one-half pound packages, and 17 cents for one-quarter pound packages. Paris green, of course, is sold for a considerably higher price, and our object has been to put this new insecticide at a figure that would be attractive and save the farmer considerable money.'

Believing that a knowledge of the composition of this material would be of interest to fruit growers and orchardists, we obtained a sample for analysis and found it to be a green powder, similar in general appearance to Paris green, though of a lighter colour.

On mixing with water, it remained longer in suspension than Paris green similarly treated. The mixture had a faint but still distinctly alkaline reaction. The analysis of the powder afforded the following data :—

Analysis of Paragrene.

Arsenious acid (As_2O_3)*	44·2
Copper oxide (CuO)	24·1
Lime (CaO)	3·7
Sulphuric acid (SO_3)	3·5
Acetic acid, undetermined.	

* Of this, 4·56 per cent was found to be soluble in water.

It is probable from the above that this substance is a mixture consisting chiefly of aceto-arsenite of copper (Paris green) and small amounts of white arsenic and of arsenite and sulphate of lime.

As regards arsenic, the essential toxic agent, Paragrene falls somewhat behind Paris green, which by law is required to contain 50 per cent arsenious acid. It is possible that the claim of the manufacturers in the matter of this constituent would receive more favourable support from the examination of further samples, as strict uniformity in composition is scarcely obtainable in the preparation of such substances, much depending upon the conditions under which the precipitation is made.

In the consideration of the properties of this new compound as a practical insecticide, there are two features worthy of mention. The first is the slightly alkaline character of the mixture with water, thus probably obviating the necessity of adding lime in order to guard against injury to foliage, as is the case with Paris green. Secondly, we have the fact that Paragene does not so readily settle out as Paris green after the necessary dilution with water, thus enabling an easier and more equable distribution of the poison.

A trial was made by the horticulturist with Paragrene for the destruction of potato bugs, but owing to the small quantity available for this use, Mr. Macoun thinks he has scarcely sufficient data to draw conclusions from as to its merits compared with Paris green. Further experiments will be made with it in the field next season.

KEROSENE-CARBOLIC EMULSION.

This spraying fluid is strongly recommended by Mr. Badger, of Warkworth, Ont., who used it for three sprayings for oyster-shell bark-louse and borers in December last with apparently good effect. The proportions advocated by Mr. Badger are :—

Kerosene	2 gallons.
Water	1 gallon.
Soap	½ pound.
Crude carbolic acid	2 pints.

For use, dilute 1 gallon of emulsion with 8 gallons of water.

From the above, it is seen that this fluid is the ordinary kerosene emulsion with the addition of so-called crude carbolic ocid. There was, however, a difficulty in keeping the mixture emulsified, the 'crude carbolic acid' rising very frequently to the surface after the dilution in the spray pump barrel. Our correspondent requested information that would enable him to prepare an emulsion that would not separate.

We were at first at a loss to understand how it was that the carbolic acid did not dissolve, since 1 part carbolic acid is soluble in 20 parts of water, and moreover, if it were not miscible why it should float, since carbolic acid is heavier than water. An examination of a sample of the material used, however, explained these facts satisfac-

torily. The greater part of the material is not carbolic acid, but crude oils (tarry matters), distillation products from coal tar. The carbolic acid it contains, no doubt is dissolved in making the emulsion and is sent out in the spray, though the crude oils float.

Further experiment showed us that this 'crude carbolic acid' dissolves readily and entirely in coal oil (kerosene) and that when it is thus first dissolved, and not added direct to the soap suds, the emulsion remains perfect for a long time. Such an emulsion, though diluted with eight times its volume of water, kept several weeks in the laboratory without any appreciable separation of the crude carbolic acid. Mr. Badger subsequently prepared the emulsion in the way suggested, mixing the 'crude carbolic acid' previously with the coal oil, and reported the results as eminently satisfactory. On February 16, he wrote: 'We used to-day 20 gallons of the kerosene-carbolic spray for lice on cattle, hogs and hens. In making the emulsion we followed your suggestion and mixed the crude carbolic acid with the coal oil before pouring it into the hot soap suds. When diluted it did not separate as it had previously done.'

This emulsion would appear to merit a thorough trial by those having occasion to use the ordinary kerosene emulsion.

BLUESTONE-KEROSENE MIXTURE.

A correspondent suggests that the addition of bluestone (sulphate of copper) to kerosene emulsion would furnish a spray for use on dormant trees that would, as it were, do double duty, destroying fungus spores and insect life.

This is not practicable, for the addition of a solution of bluestone to the emulsion causes an immediate separation of the constituents of the emulsion, the coal oil, together with the curdy copper-soap formed, rising quickly to the surface. For this reason such a mixture could not be readily applied, nor would it be desirable, since the decomposition that has occurred would have seriously impaired the efficacy of the spray, rendering it practically useless on dormant wood, so far as the action of the bluestone is concerned.

BORDEAUX MIXTURE AND TOBACCO WATER.

A correspondent asks if tobacco water could be used with bordeaux mixture, and thus obtain a spray that would be at once an insecticide and fungicide.

We made careful search through such literature as we had on the subject of spraying mixtures, but could not find any mention of this combination as having been used or even experimented with. Apparently, therefore, there are no results on record to draw conclusions from as to its efficacy.

Accordingly we prepared bordeaux mixture (4 : 4 : 40 formula) and made a strong decoction of tobacco. These were mixed in equal proportions. On standing it was noticed that separation of the copper precipitate occurred somewhat more quickly than in the untreated bordeaux mixture, leaving a clear, greenish-brown supernatant liquid. This, on being filtered off and tested, was found to be quite free from copper, showing that the tobacco water had not in any way interfered with the action of the lime upon the bluestone.

This result leads me to think that if applied when freshly prepared, the addition of the tobacco water would not affect the application from a mechanical standpoint, or destroy the efficacy of the bordeaux mixture as a fungicide.

The question as to whether the tobacco water by being mixed with the fungicide loses in any degree its power of destroying aphides is somewhat more difficult to answer. Further investigation is necessary before we can speak dogmatically on this point, but since the proposed plan could do no harm—and would reduce the labour of spraying in many instances—we think it is one worthy of trial.

SOIL INOCULATION FOR PROMOTING THE GROWTH OF THE LEGUMES.

THE USE OF NITRAGIN IN AGRICULTURE.

For several years past we have experimented with Nitragin*, a preparation containing the germs which reside in the nodules on the roots of legumes, with a view to ascertaining its practical value for encouraging the growth of clover, pease, and horse beans. The results given in detail in our reports for 1897, 1898, have on the whole been very satisfactory.

This year, the work has been continued with clover and horse beans, using the method that we have previously described as 'seed inoculation' and sowing the seed upon a practically pure sand which had been fertilized with muriate of potash and super-phosphate so that the plants might find a sufficient store of mineral matter to draw upon. Owing, however, to a delay in receiving the nitragin from Germany, we were not able to start the experiment till the season was advanced, and, as a consequence, the plants had not attained a sufficient size when growth ceased to allow any data of value respecting the relative weights of the crops being taken. If, as we hope, the clover survives the winter, we shall be able to ascertain what effect the nitragin may have had on the crop of the next year.

Notwithstanding this, we have an important result to report on the treated and untreated clover sown in 1898, that is, on its second year's growth. This experiment was started under the following conditions:—

The soil selected was almost pure sand, humus and nitrogen being present only in exceedingly small quantities. An area of 10 square yards was staked off and fertilized with the following mixture: muriate of potash, 4 oz., superphosphate, 12 oz. (This is at the rate of 300 pounds, superphosphate and 120 pounds muriate of potash, per acre).

On June 13, 1898, two rows of inoculated seed and two rows of untreated seed were sown in this area. On October 28, 1898, the plants from 4 feet in each row (the rows being 6 feet in length) were carefully dug and weighed.

First Year's Crop, 1898.

——	From Untreated Row.	From Inoculated Row.
Weight of foilage, green	225 grms.	270 grms.
" roots "	225 "	255 "
Total	450 grms.	525 grms.
Weight of foilage, air dried	85 grms.	105 grms.
" roots " "	70 "	91 "
Total	155 grms.	196 grms.

The crop from the inoculated seed was much more luxuriant than that from the untreated seed, and the above results show that the yield was considerably, practically 15 per cent, heavier. There is every reason to believe that this increased yield was due to the beneficial influence of the nitragin.

The remaining portions (2 feet) of the rows were left, and it was found when the season opened this year (1899) that the plants in both series had survived the winter. They made excellent growth, but those from the inoculated seed were very much larger. On July 10, 1899, this second year's growth was photographed and the plants taken up and weighed.

*For an account of this bacteriological preparation see the report of the Chemical Division for 1897.

Of the inoculated plants there were :—

Large,	23	plants, average height from root to crown...	28 inches.
Medium,	17	" " " ...	9 "
Small,	44	" " " ...	6 "
Total,	84		

Of the untreated plants there were :—

Large,	12	plants, average height from root to crown...	23 inches.
Medium,	15	" " " ...	7 "
Small,	37	" " " ...	4 "
Total,	64		

Second Year's Growth, 1899.

	Inoculated.	Untreated.
Total weight of plant (leaves, stems and roots) ..	745 grms.	252 grms.

Selecting the twenty-one largest plants of each series, we obtained data as follows

	Inoculated.	Untreated.
Stems and leaves....................	378 grms.	90 grms.
Roots................................	70 "	23 "
	448 grms.	113 grms.

These results are truly remarkable and of a most convincing nature. The luxuriance of the growth from the inoculated seed as compared with that from the untreated seed is shown very well in the accompanying photograph, which was taken immediately before digging the plants.

It is impossible to get a good crop of clover on land which is water-soaked, or, on the other hand, when there is a deficiency of moisture—as in a season of drought. But the results of the past three years' investigation indicate that a good crop of clover can be obtained on very poor soil with the aid of nitragin, provided the soil is drained (naturally or artificially), the season favourable, and there is a sufficient supply of mineral plant food in the soil.

There are, however, several rather serious difficulties in the way of the general introduction of nitragin. First, it must be used while still freshly prepared (the German manufacturers will not guarantee its vitality after it has been made six weeks), and, secondly, it must have been protected from strong light and kept at a temperature below 100° F.

We are of the opinion that any farmer might without purchasing nitragin obtain the same results by taking soil from a field that has grown a good crop of clover and sowing it over the poorer soil. The earth which comes from about the roots of clover contains the germs and, therefore, this method would be an actual inoculation of the poorer soil. This plan has worked most successfully with several experimenters, in both Europe and America. Another plan would be to pour cold water over the earth (previously placed in a barrel) from the rich clover land and after allowing the soil to settle, to pour off the supernatant water and soak in it the seed about to be sown.

PRELIMINARY REPORT UPON THE COMPOSITION AND PROPERTIES OF THE FAT IN 'FIRM' AND 'SOFT' PORK.

It has become a matter of great importance to Canadian farmers and those interested in the bacon export trade, to learn the cause or causes which produce 'soft'

or 'tender' pork, since such sells at a much lower price than 'firm' pork, both in the home and the English markets. With the view of furnishing useful information to pork producers, and, if possible, of solving this admittedly difficult problem, the chemical composition and physical character of the fat in these two classes of pork have been studied, it being considered that the results of such an examination would form a valuable basis or standard for reference in making further experiments. These latter would consist chiefly of feeding tests under various conditions (age, breed, exercise, &c.), and the analysis, chemical and physical, of the resulting pork.

On February 1, we received from the Wm. Davies Co., Limited, Toronto, two Wiltshire sides; the one marked 'firm,' and reported on as of excellent quality; the other marked 'soft,' and stated as of very inferior quality. The former weighed 46 pounds; the latter, 44 pounds.

Both were frozen when received, but, nevertheless, there was a most marked difference in the relative hardness of the two sides. As the sides thawed (at the temperature of the laboratory, about 70° F.) this difference—which was ascertained or measured by the resistance of the fatty portions to pressure by the finger—became still more pronounced. This was further evinced (February 2) in raising the ham by lifting as the sides lay on the table; the 'firm' remained fairly straight, whereas, the 'soft' doubled over. The relative softness is also shown in the accompanying photograph, the sides having been suspended the night previous. It illustrates the amount of 'drag' caused by the weight of the sides, similarly suspended by hooks. The extent of the 'drag' in the 'soft' side is much the greater.

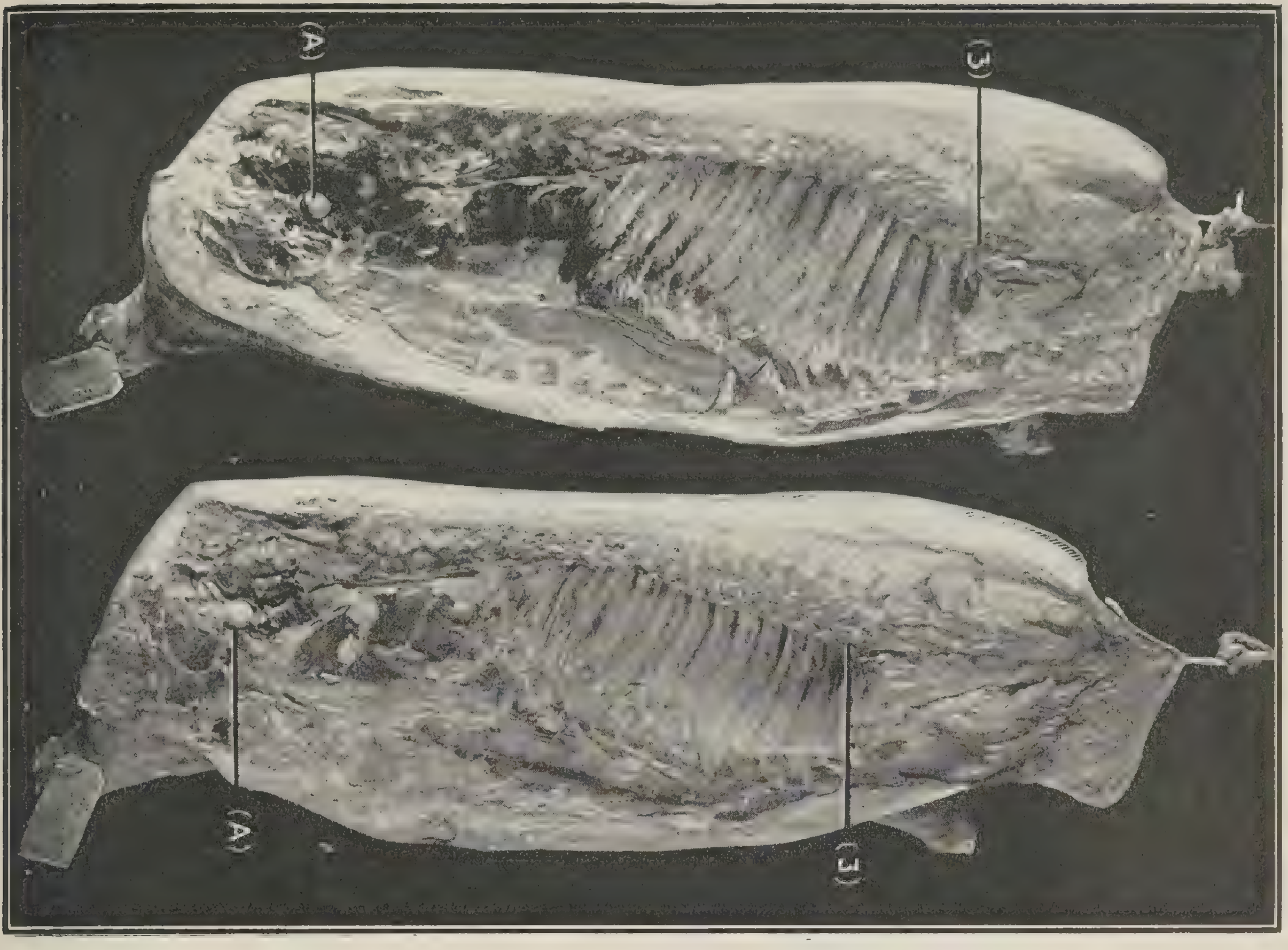
The samples of the fat for examination were obtained by first cutting the sides (*a*) immediately in front of the thigh joint (socket of the femur in the pelvic arch), and (*b*) immediately in front of the first rib, and then taking the fatty tissue at each of these sections. Those taken at (*a*) are designated in the following tables as 'ham'; those at (*b*) as 'shoulder' (see photo). The precaution of confining the place or area from which the fat was taken was made necessary from the fact that it has been stated that the fat varies considerably in composition, according to its position in the animal. Care was exercised in the preparation of the sample for analysis, to dissect out and reject all muscular tissue, blood vessels, &c.

Though the 'soft' side was somewhat the lighter of the two, its proportion of adipose tissue (fat) to muscle (lean) was the greater (see photo).

In determining the composition of the fat of the two sides, the following estimations were made: water, nitrogen (from which the amount of tissue other than fat was calculated), fat (which was obtained by difference), and the amount of olein and palmitin and stearin. The amount of salt present was also determined. Table 1 sets forth the results obtained :—

TABLE NO. 1.—*Composition of Fatty Tissue in 'Firm' and 'Soft' Bacon.*

—	Firm.		Soft.	
	Ham.	Shoulder.	Ham.	Shoulder.
Water	15·56	6·53	12·50	2·67
Salt	2·73	1·12	1·84	·48
Nitrogen	·504	·285	·243	·142
Fibre (Nitrogenous tissue)	3·15	1·78	1·52	·89
Fat, by difference	78·56	90·57	84·27	95·96
Olein in bacon	50·05	58·33	66·37	76·94
Palmitin and stearin in bacon	28·51	52·24	17·90	19·02



Soft Pork Investigation, showing Firm and Soft Sides.

Experiments with Nitragin; Clover Inoculated and Untreated, Second Year's Growth.

From the foregoing data we may notice several very important differences in the composition of the bacons. These differences are discussed in the following paragraphs:

1. It is to be observed that the percentage of water in the fatty tissue of the 'firm' is greater than in the fatty tissue of the corresponding part of the 'soft' bacon.

2. Also, that the percentage of tissue other than fat, that is, of a nitrogenous nature, was also greater in the 'firm' than in the 'soft.' This falls into line with the results stated in the preceding paragraph, since the water for the most part is contained in or held by the nitrogenous tissue. This would indicate, I think, that the walls of the cells containing the fat proper are thicker in the 'firm' than in the 'soft' or 'tender' bacon.

3 Further, it is to be noticed that the amounts of salt present are also larger in the 'firm' than in the 'soft' bacon. This is accounted for by the assumption that the salt, like the water, is held by the nitrogenous tissue to a greater extent than in the fat.

4. The percentages of fat are, from a consideration of the foregoing statements, necessarily greater in the 'soft' than in the 'firm' bacon.

5. The fat proper consists of olein, fluid at ordinary temperatures, and palmitin and stearin, solid at ordinary temperatures. The data show that the percentage of olein is much greater in the 'soft' than in the 'firm' bacon, while as a natural consequence the percentages of palmitin and stearin are greater in the 'firm' than in the 'soft' bacon. These facts furnish the cause of the greater softness in the 'soft' or 'tender' bacon.

COMPOSITION OF THE FAT.

In order to obtain a fuller knowledge of the composition of the fat proper in the 'firm' and the 'soft' bacons, the fatty tissue was rendered and the pure fat filtered off. The analysis of these fats furnished the data in Table No. 2.

TABLE NO. 2.—*Composition of Fat from 'Firm' and 'Soft' Bacon.*

—	Firm.		Soft.	
	Ham.	Shoulder.	Ham.	Shoulder.
Olein (calculated)	63·71	64·40	79·95	80·18
Palmitin and stearin	36·29	35·60	20·05	19·82
Ratio of palmitin and stearin to olein	1—1·76	1—1·80	1—3·99	1—4·02

These figures show very clearly that the fat of the 'soft' bacon contains a much larger percentage of olein than that of the 'firm' bacon, with a corresponding decrease in the percentage of palmitin and stearin.

They also make evident that no great difference in the composition of the fat taken from the ham and from the shoulder of the 'firm' bacon exist, and that the same statement regarding the fat of the ham and shoulder of the 'soft' bacon also holds true.

PHYSICIAL AND CHEMICAL CONSTANTS OF FAT FROM 'FIRM' AND 'SOFT' BACON.

Table No. 3 sets forth certain determinations that were made upon the pure, filtered fat. These are of considerable importance, since, though of a strictly scientific character, they allow us to make deductions easily understood regarding the nature of the fats :

TABLE No. 3.—Physical and Chemical Constants of Fat from 'Firm' and 'Soft' Bacon.

—	Firm.		Soft.	
	Ham.	Shoulder.	Ham.	Shoulder.
Melting point	37·6°C.	37·75°C.	27·4°C.	28·2°C.
Spec. gravity at 96°C	·8668	·8859	·8678	·8740
Spec. gravity at 100°F	·9009	·8980	·8970	·8988
Sapon. equivalent	285·3	282·3	287·3	286·0
Reichert number	·408	·714	·408	·663
Iodine absorbed	55·3	55·9	69·4	69·6

1. The melting point of the fat from the 'soft' bacon is practically 10° Centigrade lower than that of the 'firm' bacon.

2. The specific gravities in both series are so close that it is not possible to use this constant as a means of differentiation or for deducing therefrom any information respecting the relative composition of the fats.

3. The saponification equivalent likewise appears to be of little value in the diagnosis.

4. The Reichert number shows the practical absence of volatile fatty acids in both series, though there is an indication of larger traces of the presence of such in the shoulder fat than in that of the ham.

5. The 'Iodine absorbed' is of great value in this investigation. From it may be calculated the percentage of olein or liquid fat present in a fat. The data here presented clearly demonstrate the larger amount of olein in the 'soft' fat, a fact that gives the explanation for the greater softness or tenderness of the 'soft' bacon.

On the completion of the work recorded above, it was deemed advisable to institute a series of feeding tests upon the Central Farm, to be followed by a similar examination in the laboratory of the pork produced. Such a series (employing nearly 200 pigs) was commenced in the month of May, and is still in progress. All the pigs were between one and two months old when the experiment begun. The scheme of rations used for these pigs was drawn up by Mr. Grisdale, the Agriculturist, who has the control and management of the investigation outside the work done by the Chemical Division.

Already some seventy carcasses of these pigs have been submitted to chemical and physical examination—a work which has consumed more than four months time of the chemical staff. If, as we hope, the investigation proceeds satisfactorily, the data will be completed by April, 1900, when it is expected they will be collected and published, together with deductions therefrom, in bulletin form. Such an extensive trial should furnish us with results from which deductions of value can be made concerning the causes

producing 'soft' pork. The effects of food, as regards character and quantity, of exercise, &c., &c., upon the quality of the pork produced will, it is expected, be brought out, enabling us to furnish information that will be of service to those raising and feeding pigs.

At the outset of the experiment above referred to, it was thought well to ascertain the character of the fat in very young pigs, so that we might have data respecting age and immaturity as affecting the quality of the bacon. Accordingly, before the special feeding was begun, four small pigs were slaughtered and their fat examined in the laboratory. The dressed weights of the pigs ranged from 23 to 42 pounds. Inspection at the factory showed all to be more or less soft. The proportion of olein to palmitin and stearin in the fat of these pigs is given in the subjoined table :—

—	A.	B.	C.	D.
Olein	90·6	86·9	83·3	73·3
Palmitin and stearin	9·4	13·1	16·7	26·7
Ratio of palmitin and stearin to olein	1:9·6	1:6·6	1:5·0	1:2·7

Though the percentages of olein are seen to vary considerably, they are all sufficiently high to characterize the bacon as soft, thus corroborating the expert's opinion.

The above data are probably insufficient to base any final conclusion upon, yet they appear to indicate that age and weight—or perhaps rather immaturity or lack of 'ripeness'—are factors having a marked effect upon the character of the fat. Further work may show that the percentage of the olein decreases as the pigs grow and if such be the case, one of the causes of softness, at least, will have been discovered. The series of experiments now in progress will furnish data on this important feature of the problem.

WELL WATERS FROM FARM HOMESTEADS.

It is gratifying to be able to report that among the waters received this year for analysis a much larger percentage of good samples occurs than heretofore. The immediate relationship between an unpolluted, wholesome water supply and good health and thrift among cattle is one, however, that still needs emphasizing in many parts of the Dominion. It seems more than probable to the writer that many deaths among horses and stock, generally reported as due to obscure and apparently unknown causes, might be traced to the continued drinking of contaminated water, for such, apart from disease germs they may harbour, may, and often do, contain compounds (derived from certain chemical changes that take place in the organic matter of the excrementitious refuse present) possessing well-marked poisonous properties. The value of the abundance of pure water for the farmer and dairyman can scarcely be over-estimated. If this were more widely recognized, greater care would be exercised in guarding the well against the infiltration of noxious materials.

Respecting the purification of waters largely charged with saline matter, such as common salt, sulphates of soda, lime, and magnesia, we have to say that no system of filtration or precipitation will be found altogether effective. Recourse must be had to distillation. Stills for household purposes are now manufactured that can be used on the kitchen stove, and which require but very little attention. Sufficient water for drinking and culinary purposes, free from all soluble saline matter, may by these means be readily and cheaply obtained.

ANALYSIS OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1898.				
1	Millerton, N.B.	J. B.	Dec. 10..	Trace.	·052	·082	·6
2	Middlchurch, Man.	R. R. T., No. 1..	" 12..	·03	·04	·041	18·6
3	"	R. R. T., No. 2..	" 12..	·01	·10	·024	29·0
4	South March, Ont.	M. W. per Dr. G.	" 13..	·02	·11	2·439	8·8
5	Nappan, N.S.	R. R.	" 24..	·016	·086	·094	4·8
6	Ottawa, Ont.	A. G.	" 28..	·015	·213	·1397	1·0
			1899.				
7	Dresden, Ont.	O. McV.	Feb. 10..	·255	·058	....	70·0
8	Maria, Que.	T. J. M.	" 20..	·02	·17	....	24·6
9	Dauphin, Man.	Wm. M.	" 22..	·86	·30	1·432	96·0
10	Chance Harbour, N.S.	Capt. D. C. F.	Mar. 24..	·07	·128	4 85	26·4
11	Alexander, Man.	J. McG.	" 27..	9·55	·115	·42	4700·0
12	Pembroke, Ont.	E. B.	" 28..	·034	·122	·0115	2·6
13	Rapid City, Man.	G. B. S.	Apr. 11..	·07	·925	7·247	110·0
14	Deloraine, Man.	J. M. D.	" 11..	3·69	·235	·576	116·0
15	Central Bedeque P.E.I.	F. L.	" 25..	1·66	·72	·592	200·0
16	Hintonburgh, Ont.	D. H. McL.	May 8..	Trace.	·187	·094	·15
17	"	J. B.	" 17..	·03	·233	2·775	88·0
18	Saskatoon, N.W.T.	Mrs. T.	" 19..	Trace.	·264	·0329	6·6
19	Enderby, B.C.	W. F. H., No. 1.	June 2..	·02	·10	1·156	7·4
20	"	W. F. H., No. 2.	" 2..	·012	·175	1·208	2·8
21	Kamloops, B.C.	E. A. H.	" 26..	·01	·085	·09	6·2
22	Lennoxville, Que.	A. W. G.	" 26..	Trace.	·11	4·241	28·0
23	"	E. C. G.	July 8..	·06	·09	4·398	23·5
24	Newbury, Ont.	J. H. B.	" 10..	·06	·20	·0659	45·8
25	Ompah, Ont.	Alex. Watt.	" 10..	·54	·342	6·127	15·2
26	Scotch Village, N.S.	J. McH.	" 15..	·04	·095	None.	12·0
27	Esquesing, Ont.	J. J.	" 19..	·88	·184	11·019	11·8
28	Billings' Bridge, Ont.	H. C. R.	" 22..	·14	·315	13·14	43·8
29	Newbury, Ont.	J. H. B., No. 1.	" 27..	·215	·172	1·24	53·6
30	"	J. H. B., No. 2.	" 27..	·04	·105	14·34	72·0
31	Sutton, Que.	A. E. E., No. 1.	Aug. 22..	Trace.	·04	1·795	32·4
32	"	A. E. E., No. 2.	" 22..	Trace.	·02	·247	....
33	East Dunham, Que.	P. K.	" 22..	·07	1·93	None.	3·0
34	Carlake, Ont.	R. R. C.	" 30..	2·25	·04	·124	1100·0
35	Vernon, B.C.	J. A. H.	" 31..	·06	·03	·148	1·2
36	Nepean, Ont.	R. N.	Sept. 5..	None.	·0375	2·849	21·0
37	Glen Ewen, N.W.T.	C. L. G. T.	" 9..	·445	1·0	·0518	240·0
38	Fredericton, N.B.	F. S. H.	" 20..	None.	·0625	·417	None.
39	East Dunham, Que.	P. K.	" 23..	·08	·80	·0329	2·4
40	Hamilton, Ont.	W. G. W., No. 1.	" 25..	·84	·235	None.	144·0
41	"	" No. 2.	" 25..	·08	·065	·297	30·0
42	"	" No. 3.	" 25..	·02	·04	·147	8·4
43	"	" No. 4.	" 25..	2·03	·02	·379	1120·0
44	Ville Marie, Que.	A. M. D.	Oct. 2..	None.	·036	·0823	·5
45	Regina, N.W.T.	G. S. D.	" 24..	8·304	·08	·4	6125·0
46	Huntley Township, Ont.	E. E.	" 31..	·07	·085	5·566	10·6
47	Almonte, Ont.	R. McK.	" 31..	·406	·099	6·542	22·0
48	Penniac, N.B.	C. N. G.	" 31..	·045	·08	5·11	40·0
49	Wapella, N.W.T.	H. C. D.	Nov. 27..	·11	1·38	2·195	22·0

WELL WATERS, 1899.

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
96·0	56·0	40·0	None	An excellent water; free from all pollution.
494·4	370·4	124·0	"	Free from pollution.
662·4	478·4	184·0	Very slight traces	"
273·6	189·6	84·0	Traces	Polluted.
58·4	38·4	20·0	Very slight traces	An excellent water; free from pollution.
56·0	21·6	34·4	"	Free from contamination.
441·6	408·6	33·6	"	Of very doubtful purity.
283·2	170·4	112·8	None	Free from pollution.
7391·2	6636·0	1055·2	"	Unwholesome.
260·0	180·0	80·0	"	Suspicious.
10780·0	10037·0	743·0	"	Doubtful.
59·2	40·8	18·4	"	Unpolluted.
6136·0	5069·0	1067·0	Traces	Unwholesome; heavily charged with organic and salin matter.
3608·0	3380·0	228·0	None	Very suspicious.
472·8	415·2	57·6	Very heavy traces	Exceedingly bad water.
51·2	21·6	29·6	Slight traces	Good water.
845·6	646·4	199·2	Heavy traces	Seriously polluted.
637·0	426·0	211·0	None	Good water.
2032·8	1531·2	501·6	Very slight traces	Saline water.
256·0	176·0	80·0	Very heavy traces	Suspicious water.
1260·8	921·2	269·6	Heavy traces	Wholesome water.
298·0	170·0	128·0	None	Suspicious.
....	....	....	....	"
464·0	320·0	144·0	Slight traces	"
370·0	249·0	121·0	Very heavy traces	Seriously contaminated.
2428·8	1919·2	509·6	None	Free from all contamination.
588·8	341·6	247·2	Slight traces	Very bad water.
723·2	568·8	184·4	Very heavy traces	Most seriously polluted.
501·6	353·6	148·0	Slight traces	"
608·8	452·0	156·8	Heavy traces	Very bad water.
282·0	189·2	92·8	Very slight traces	Suspicious.
44·8	27·2	17·6	None	Exceptionally good water.
194·4	94·4	100·0	Heavy traces	Free from sewage pollution.
4890·0	4094·0	796·0	Traces	Mineral water.
228·2	201·8	26·4	Heavy traces	Good water.
428·0	292·0	136·0	Traces	Very suspicious.
12092·0	10288·8	1603·2	Slight traces	Unwholesome.
67·0	31·0	36·0	None	Free from pollution.
117·6	48·0	69·6	Traces	"
563·2	531·2	32·0	None	Suspicious.
541·6	391·2	150·4	Traces	"
598·4	470·4	128·0	Very slight traces	Good.
3628·0	3184·8	443·2	Heavy traces	Not a first-class water.
202·0	272·0	30·0	Very slight traces	Very good water.
11574·0	10144·0	1430·0	Traces	Strongly saline.
328·0	250·0	78·0	Heavy traces	Seriously contaminated.
....	....	....	....	"
286·0	252·0	34·0	Slight traces	Polluted.
1820·0	1567·5	252·5	Heavy traces	Contaminated.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST

(JAMES FLETCHER, LL.D., F.L.S., F.R.S.C.)

1899.

DR. WM. SAUNDERS,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report on some of the more important subjects which have been brought officially under my notice during the past season. There is, as in previous years, and as must always be the case, a vast amount of material accumulating in the Division which cannot be mentioned in the annual report, but which is frequently of use in answering correspondents and explaining to visitors the work of the Division.

Since the appointment of Mr. Arthur Gibson as a new assistant, in April last, many specimens have been secured for permanent exhibition in the museum. Exhibition cases in which the commonest injurious and beneficial insects can be shown have been a great desideratum here, a want which is now being filled as quickly as possible. Several new cases have been secured during the summer, but when the accumulated material has been arranged even these will not be sufficient to display all the specimens, and other cases are now being made.

The experiments in growing grasses and fodder plants have been continued and, as in the past, have proved of great interest to all visiting farmers. The Awnless or Smooth Brome Grass, which since 1887 I have taken great pains to introduce and distribute through the north-western provinces, still continues to give the greatest satisfaction to all who have tried it. It is a heavy producer of excellent fodder and hay, is succulent, appears early in spring and lasts late into the autumn. It is a free-grower, thriving both on light sandy soils and in rich low bottoms. Owing to its vigour and free growth, it has been found useful for holding alluvial flats liable to flooding and also as a binder of drifting sand. Some two or three years ago a sample of seed was sent to Mr. R. J. Bouteiller, Superintendent of Sable Island, off the coast of Nova Scotia, to whom it has given much satisfaction. He reported on it last year as follows :—'The Awnless Brome Grass seed was planted about the 20th May, and I mowed a heavy crop in August, much of it headed out. I am much pleased with it and believe it will be a success.' During the past summer Major F. Gourdeau, the Deputy Minister of Marine and Fisheries wrote as follows :—'Referring to the Awnless Brome Grass, of which you supplied seed to Sable Island, I beg to inform you that a letter has been received from the Superintendent of the island, in which he states that the plot of this grass is ahead of anything else, and measured on the 27th June between 3 or 4 feet and more in height, while timothy in just as good ground was a little over half of that.'

Awnless BromeGrass has also given tolerable satisfaction upon alkali patches in the west, succeeding better than all other varieties tried.

Subjects requiring special attention since I last reported were the following :—

The Hessian Fly.—A serious outbreak in Manitoba.

The Rocky Mountain Locust.—This insect again appeared in some numbers in southern Manitoba, but was not the cause of an appreciable diminution in the crops. The exceptionally wet and late season in Manitoba during the past summer was unfavourable for its early development and spread, and the farmers, having been stirred up to an appreciation of the danger of allowing this insect to remain undisturbed, ploughed down the greater part of the stubbles this autumn, thus burying the eggs too deeply for the young to emerge next spring.

The Destructive Pea Aphis.—One of the most notable outbreaks of the year was by a plant-louse which has been given the above name but which before this year was unknown.

Root Maggots.—Some experiments against these destructive enemies of the gardener were tried last season with many different substances, but so far without very satisfactory results. Mixtures containing some form of carbolic acid were most useful.

The Diamond-back Moth (*Plutella cruciferarum*, Zell.).—Late in the autumn there was in eastern Ontario a widespread and severe attack upon cabbage of various kinds, rape, and turnips, by this insect, which has been well known for many years as an occasional pest of these plants, and was fully treated of, and figured, in my report for 1890. In *Farm Insects*, by John Curtis, 1860, the same insect is described and well figured as the Turnip Diamond-back Moth.

The Asparagus Beetles.—Two new enemies of the gardener have appeared in Canada for the first time this year, the two Asparagus Beetles. These are treated of at some length later on.

Fig. 1.—The Forest Tent Caterpillar.

Tent Caterpillars.—Orchard and shade trees were again this year seriously injured throughout the greater part of Ontario and Quebec by the caterpillars of the two common species of Tent Caterpillars. Nothing new can be added as to remedies; these consist of the collection of eggs in winter, the destruction of the nests and clusters of young caterpillars in spring, and last, but most important, the spraying of trees with poisonous mixtures as soon as possible after the hatching of the eggs. The last operation, when performed carefully, is a never-failing remedy.

Bark-lice.—The San José Scale and several other allied species of scale-insects have naturally been the subject of much correspondence. Thorough experiments are now being carried out by specialists in all parts of North America with the hope of discovering a practical remedy. Several materials have given good results which with ordinary insects might be considered all-sufficient remedies, but with the San José Scale it seems inadvisable to recommend under the existing laws which have been passed by the Federal Government and those of Ontario and British Columbia that fruit growers themselves, should be allowed to treat their trees with any of the materials which, up to the present, have been claimed to be 'sure remedies,' such as pure kerosene, the same mechanically mixed with water, and crude petroleum.

The Apricot Scale (*Lecanium armeniacum*, Craw).—Another scale insect from California, which in some way has been introduced into the Eastern States, and is spreading there to some extent, has been found in two or three orchards at Sherbrooke, Que.

THE RASPBERRY WEB-WORM.—A local but interesting attack by a new enemy to cultivated raspberries was reported from St. John, N.B., last year, and has been worked up during the past season.

THE CRANBERRY LOOPER (*Caterva catenaria*, Cram.).—A new attack of some severity upon strawberries was by the common 'Cranberry Worm,' which was reported by Mr. George Bonner, of Point Aconi, Cape Breton, N.S.

THE PEA MOTH (*Semasia nigricana*, Steph.) is still much complained of, particularly in the Maritime Provinces, as shown by the following letter :—

'CLIFTON (King's Co.), N.B., December 19.—I have not made any recorded observations, but think this insect was not quite so destructive last season as usual. It has, however, come to be such a matter of course with us, that we take its ravages quite philosophically and pick the caterpillars out of our peas for the table; when too bad, we throw the whole mess to the pigs or cows. This insect has been injurious here for a period beyond my recollection, some 50 years.'—J. W. WETMORE.

THE CARROT RUST-FLY (*Psila rosæ*, Fab.) continues to be a troublesome pest of carrots in the province of New Brunswick. Mr. J. E. Wetmore, of Clifton, N.B., writes :—'Of late years we have about abandoned the culture of the tender varieties on account of its depredations. It does not trouble the hardier varieties here apparently, for we can get full crops of the white carrots when the orange ones are a complete failure in the same field.'

In Prince Edward Island, Father Burke reports widespread injury by plant-lice upon carrots.

THE SPRUCE GALL-LOUSE (*Chermes abietis*, Linn.)—A cause of considerable inquiry and anxiety among those interested in the manufacture of paper during the past year or two has been the Spruce Gall-louse. This insect is prevalent through a large part of Ontario, attacking the Black and Norway Spruces. In the Rocky Mountains, galls probably made by a different species were noticed in abundance on White Spruces at Banff, Alberta, and, on Vancouver Island, trees of the Menzies Spruce (*Picea sitchensis*, Carr.) in certain places in the forests, were much disfigured by another species of Chermes, probably *C. sibirica*, Cholodk., which forms large galls, sometimes two inches in length by nearly one in diameter. These were not found at all on the Douglas Spruce.

THE BLACK VIOLET APHIS.—An infestation of greenhouses not previously complained of in Canada by the above insect occurred in Toronto, and is treated of later in this report.

THE GREENHOUSE LEAF-TYER is also a new pest treated of hereafter.

THE CARPET BEETLE OR 'BUFFALO MOTH' (*Anthrenus scrophulariæ*, Linn.).—This troublesome pest of the housekeeper seems to be spreading and becoming more destructive year by year. During last spring a few specimens were taken out of doors at Ottawa on the flowers of Currants and Spiræas. Beetles were also sent from Bewdley (Northumberland Co, Ont.) which had been found by Mr. T. W. Ramm, in the folds of a cloth left hanging in an apple tree during winter.

Correspondence.—From November 30, 1898, to November 30, 1899, the number of letters received by the Division was 2,495, and of letters sent 2,320.

Meetings attended.—Meetings of farmers, dairymen and fruit growers have been attended at the following places :—January 10 and 11, at Kingston; 27, at St. Catharines, February 3, at Hemmingford, Que.; 10, at North Gower, Ont.; March 10, at Merivale, Ont.,

17, at Montreal; April 3, at Napanee, Ont.; 4, Brampton; 5, Oakville; 6, Hamilton; 7 St. Catharines; and three series of meetings in Manitoba, the North-west Territories and British Columbia are reported on at the end of this report.

Acknowledgments.—As in previous years, I am under great obligations to many correspondents, to practical farmers, who have much aided the work of the Division by making observations and sending in prompt reports on the occurrence of injurious insects and weeds, and to scientific experts in Canada and abroad. I must particularly mention in this connection Prof. John Macoun, of Ottawa, for assistance on many occasions, and also Dr. L. O. Howard, United States Entomologist, of Washington, D.C., and Dr. J. B. Smith, of New Brunswick, N.J., for frequent assistance in the identification of insects and for the use of electrotypes and magic lantern slides.

In conclusion I have much pleasure in expressing my appreciation of the enlarged opportunities for doing good work in the Division entrusted to my care, which have been granted me during the past year.

Mr. Arthur Gibson, of Toronto, was appointed as an extra assistant on April 1 last, and has shown great assiduity and care in all matters entrusted to him. Mr. J. A. Guignard, B.A., the Assistant Entomologist and Botanist, continues to help me in all branches of the work of the Division, and as heretofore has done much to bring the Division of Entomology and Botany to such degree of efficiency as it has attained.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

CEREAL CROPS.

Complaints of injury to the wheat crop by insects during 1899 were few, with the exception of a new and severe outbreak of the Hessian Fly in Manitoba, a rather serious occurrence of the same insect in Western Ontario, and a slight one in Prince Edward Island.

In the November *Crop Report* (Ontario Bureau of Industries) it is stated:—'There has been a notable absence of insect pests. There are few complaints of insect pests except that Hessian Fly, Jointworm and Wireworm have done some damage.' 'Alberton, P.E.I., October 31.—Seldom has Prince Edward Island garnered a more satisfactory all round harvest than this year. Hay is bursting the mows, the granaries are filled with golden grain, and although in some sections potatoes are not an average crop, on the whole, we rejoice in an excellent yield of roots.'—Revd. A. E. Burke.

'Pleasant Grove, P.E.I.—The wheat crop on the whole is a good one; some fields were damaged by what we call 'black neck,' said by some to be the rust. Attacks by the Hessian Fly were not common, a few plants being injured, but we have had a considerable quantity of Wheat Midge on the Island this year.'—E. Wyatt.

Barley was slightly injured by Hessian Fly in Manitoba, and oats and corn in Ontario to some extent by grasshoppers. The two most serious outbreaks of the season upon cereals were by Hessian Fly in Manitoba and in Western Ontario, and by a new enemy of the pea, the Destructive Pea Aphis, which did great damage to field peas from the Maritime Provinces to Western Ontario in Canada, and extended right down to the Southern States in the Union. That old enemy, the Pea Weevil, was also more than usually destructive and abundant during the season of 1899.

THE HESSIAN FLY

(*Cecidomyia destructor*, Say).

Fig. 2.—The Hessian Fly—enlarged and natural size.

Complaints of injury by the Hessian Fly during the past season were numerous to fall wheat in Ontario and to spring wheat in Manitoba. Wheat was injured in many parts of Manitoba, but chiefly in the Red River valley. The most western occurrence reported to me (with specimens) was from Moose Jaw, in the North-west Territories. At the request of some of my correspondents for public advice as to the best means of preventing future loss, articles were prepared for publication in the *Farmer's Advocate* (September 15) and the *North-west Farmer* (September 20), both excellent agricultural journals, widely circulated and read by farmers, in which the chief points in the life history of the insect were given and suggestions made as to the best known remedies.

The following extracts from some of the large correspondence on the matter will show the extent and nature of the outbreak. The first reports and specimens from Manitoba were received from Mr. Hugh McKellar, Chief Clerk of the Provincial Department of Agriculture.

'Delmer (Norfolk Co.), Ont., August 8.—In view of the immense damage done by the Hessian Fly to the wheat crop in this and in many other localities throughout the

province, farmers are very much interested in the matter and would like to know something of the habits of this insect—whether it is likely to assert itself in next year's crop, whether the discontinuance of wheat growing for a season would be necessary to exterminate it, or whether such omission would be of any value in eliminating the pest, &c., &c. Any information you could give us would be very gratefully received, especially at this juncture—the eve of another seeding.'

'Delmer, September 13.—In South Oxford the fly was very injurious, destroying fully one-half of the fall wheat remaining, after an unusually severe 'winter killing'—there was scarcely a wheat field that was not injured more or less; the earlier sown suffered most. In North Oxford damage was much less, in West Brant, also much less, ditto in West Norfolk, in East Elgin middling severe, quite severe in East Middlesex; and again, in North and West Middlesex not so severe.'—CHAS. BRADBURN.

'Winnipeg Man., August 26.—Herewith I am sending you specimens of an insect that has done considerable damage on the farm of Mr. James Little, Stonewall. The specimens were forwarded by Mr. Ira Stratton, of Stonewall, who says that about one-quarter of Mr. Little's wheat has been cut down by these insects. Would you kindly let us have any information at your command regarding this pest, and what measures should be adopted to prevent its recurrence next year?'—HUGH MCKELLAR, *Chief Clerk, Dept. Agriculture.*

'Macdonald, Man., August 26.—I notice since starting to cut my wheat that quite a lot of the straw is broken just above the second joint, although the heads seem to be well filled; of course the sap is not altogether stopped as the straw is not broken completely off. I find on examining it that there is a single maggot or worm in a brown shell, between the leaf and stem just above the joint, that has caused the injury. Can you tell me what it is and if it is likely to be worse another year? There is from 1 to 7 or 8 per cent of the straw affected with it.'—HENRY KIRKWOOD.

'Portage la Prairie. Man., August 28.—Inclosed find wheat joints which I have cut from my field. The wheat is bent down just above the joint. I find by opening the straw that there is an insect on the upper side of the joint. The grain in the head appears to be all right, but the straw and head are not as large as the balance that is standing. My heavy wheat does not appear to have been affected. Would you kindly let me know through the *Nor-west Farmer* what it is, as I presume there are other fields throughout the province affected the same way?'—CHAS. CUTHBERT.

'Winnipeg, August 29.—At several points throughout the province I have noticed this year in the wheat fields that a greater or less proportion of the straws appear to break about the first joint from the ground, and, where this is very bad, it gives almost the appearance of their having been broken down by hail, except that most of the straws seem to lean in one direction as though they had gone down under pressure of high winds from one quarter. I am told by some parties that a little worm about $\frac{1}{4}$ of an inch long is found in the straw, at the first joint. The appearance of the head is entirely different from what we call "dead heads" as the grain is maturing in the heads, some of them still being comparatively green, although I think in every case the grain will be shrivelled, and the heads seem to be shorter and smaller than the average heads in the field. I saw two fields of this out at Melita a little while ago, and yesterday at Otterburn saw a great deal of it, and I understand from the farmers at Emerson, that it is very prevalent throughout that district. I was also speaking to a man from Plum Coulee, who told me he had to set his binder much lower than usual in order to avoid cutting off the heads that were broken down, and I am inclined to think that this trouble, whatever it is, is very prevalent throughout southern Manitoba.'

"Winnipeg, Oct. 11.—I fancy the damage done by the Hessian Fly has been pretty serious in some localities, but, as people were not acquainted with the insect or were not looking for it, not many noticed it; perhaps, too, they attributed the shortage to a wrong cause. I understand that its attacks were very bad in the Stonewall, Carman and Niverville districts."—G. H. GREIG, of *The Farmer's Advocate.*

'Winnipeg, Oct. 3.—In response to your request for information on the Hessian Fly in this province, by Mr. McKellar's instructions, I made an excursion to Stonewall on Friday and Saturday last. There is no doubt whatever that the fly is all through

the wheat-growing country around Stonewall and Balmoral—every farm I inspected had it. I found puparia in every wheat and barley field I entered, and in every stack of unthreshed wheat looked at. I was able to examine the screenings from one threshing place (on the farm of Mr. J. Little) and here there were puparia in abundance. The first place visited was the farm of Mr. J. McEwen, where there was a piece of breaking very bad with the fly. Mr. McEwen estimates the damage at one-third of the crop, and I am sure the estimate is a careful one. The next place visited was Mr. Jas. Little's. It was from this farm that the specimens were sent to you last month. The damage here was quite as great as on the last place, but in this case the land bore a crop of wheat last year. It was on this farm that I examined the screenings from the thresher. Mr. Martin Shepley estimates the damage done to his summer-fallow at one-fourth or perhaps as much as one-third. I have mentioned these three farms because they are the only cases in which I was able to see the farmers and discuss the question with them. As to barley I could secure no estimate of the damage done. No barley had been threshed, and there is not the same interest in the barley crop as in wheat. I did not find the puparia so numerous in barley fields as in wheat fields. The puparia were almost invariably above the second joint, usually singly, though sometimes in twos and threes. I collected a number of specimens of which I send you a few in case you wish to breed the parasites.

'Summer-fallow and breaking suffered quite as badly and as generally as land cropped last year. Fallow and breaking are naturally the earliest sown, as they are soonest in condition for seeding. The weather during seeding was very cold and backward, and continued so up to the 10th June, after which the most perfect conditions for growth prevailed. I may also quote the statement of Mr. J. Little that the wheat which was earliest cut was less broken down than that cut later. In reply to a further question, he said he did not know whether it was less *damaged*, but it was certainly less broken down. Mr. J. McEwen stated that greener portions of a field were less broken down than riper ones. From this I would point out that the amount of damage was estimated generally from the state of the crop before threshing, that green or under-ripe grain does not break off so readily, and that a crop cut a shade green would not show the full amount of damage done.'—MELVIN BARTLETT, *Dept. Agriculture.*

'Buffalo Lake, Moose Jaw, Assa., Aug. 30.—When I wrote you some three or four weeks ago with regard to the wheat pest, I had not observed any indications of it. Since then it has become quite evident. I learn from a neighbour adjoining me that he had it last year. At present there are quite a number of heads through my crop and a very considerable number in my near neighbour's. It seems especially bad on the outside of the field; where he was cutting wheat 2 or 3 days ago, the outside 10 or 15 feet was very materially damaged. It seemed to attack the maturer heads, not troubling the greener grain much.'—G. S. TUXFORD.

'Emerson, Man., Sept. 1.—I am enclosing to you some samples of wheat straws injured by the insect referred to you some days ago by Mr. Geo. Greig of the *Farmer's Advocate*, Winnipeg. You will find them located immediately above the joint first from the ground. Kindly examine and let us know the name, and likelihood of recurrence another year, remedy if any, and any information you deem of use. This pest is more or less found all over the province, and is estimated to have done as much damage in some places as to reduce the yield 20 per cent.'—W. W. FRASER.

'Winnipeg, Sept. 1.—We enclose sample of straw from Winkler Station, where it has drawn attention. Is it the Hessian Fly?'—RICHARD WAUGH, *The Nor-West Farmer.*

'Winnipeg, Sept. 1.—Enclosed find a few stems of wheat straw cut at ground and fallen in crop so as to be missed by the binder. In each straw is an insect, the cause of fall. About one in a hundred of the stems was so affected. What is it and how can it be treated?'

'Holland, Man., October 4.—In every field I have looked (that is in Manitoba), I have found traces of the Hessian Fly. I know of no other insect doing the farmers any injury this season.'—F. D. BLAKELY, of *The Nor-West Farmer.*

'Balmoral, Man.—I am sending you under separate cover an insect in pieces of wheat straw. It is found at the joint nearest the ground. Just above this joint

it eats its way through the stalk and escapes. The straw bends or breaks at this place, leaving the straw as if fowls had pulled it down. One man told me his wheat would not be more than half a crop owing to the work of this insect. Would you kindly let me know what it is? It was not noticed until cutting commenced'.—R. W. NEILL, M.D.

'Pilot Mound, Man.—A considerable quantity of the wheat is breaking down badly at the second joint. I was attributing the cause to the straw being weak, owing to rust and showery weather making it softer than usual. I have examined some of the broken straws and found one containing a chrysalis, which I enclose. I hope the western wheat fields are not going to be troubled with weevil or any kindred pest. The wheat crop in this district is practically all in stook. Several were thinking that it is always better to begin on the green side as a very severe wind storm seemed to have broken the straw down.'—D. A. STEWART.

'Portage la Prairie, Man.—As to the extent of the damage by the Hessian Fly, it is very uncertain, some districts were more seriously affected than others. We had several light hailstorms here and there, and many farmers thought they were slightly damaged, but I now think that the damage was caused by the Hessian Fly. I find that the yield is not up to the expectations of the farmers, more especially in the older districts, and I am convinced that it was the Hessian Fly that reduced the yield. But we have been blessed with the most uniform good crop I have ever seen in the province, and hence the slight damage done is not seriously felt. The weather has been, and is yet, simply grand. I found in gathering these specimens I send, that they were more plentiful in late grain than in earlier, also the last heads to come out were the most affected.'—CHARLES BRAITHWAITE.

As stated above, last season is the first in which the Hessian Fly is known to have done harm to crops in Manitoba, and many farmers did not recognize the insect until the matter was brought before them by discussion in the daily journals and agricultural press. With a view to gathering as much information as possible about the occurrence and extent of injury, a series of questions was submitted by the *Farmer's Advocate* to its readers, and answers were received from many of them. Some of these answers were published in the issue of December 5, from which it would appear that the loss, according to locality, was from 5 to 25 per cent of the crop, and that the attack was general, irrespective of the nature and condition of the soil, or the time of seeding. Nevertheless farmers in different localities held strong opinions that there were decided differences, some stating that early sown grain was exempt from attack, while others thought the opposite. Mr. W. R. Graham, Superintendent of the Stony Mountain Penitentiary farm, Manitoba, stated to me on October 4, 1899, that the Hessian Fly did not attack his early sown wheat at all, and he thought this was general throughout his neighbourhood, that in 1899 early sown wheat was much less attacked than that which was sown late and held back by the late season.

In answer to the questions in the *Farmer's Advocate*, Mr. R. W. Greig, of Otterburn, reports that late-growing grain suffered most, although, in some cases, that which was sown very early was injured more than some of that which was put in late. Mr. H. O. Ayearst, St. Paul's municipality, reports wheat on new land as 'badly damaged, at least 25 per cent of the crop; no injury on old land, new land only being injured.' On the other hand, Mr. S. R. Henderson, of Kildonan, reports it to have been 'worst on old land that had been summer-fallowed, with surface cultivation in the spring, and sown early.' Mr. Robert Fisher, of Springfield, says: 'I could see no difference on old land or new, fallow or stubble, fall or spring ploughing, or in early or late sowing, though none of our sowing was very early. My own crop was seriously injured by the fly, 8 to 18 per cent of the whole crop being destroyed.'

The extent of injury was doubtless due to the condition of the wheat plant at the time the females were laying their eggs. The injury by the maggots of the summer brood is, as a rule, at the lowest joints of the stems, and, as upon hatching the young maggots work their way down to the base of the leaf upon which the eggs were laid, it would indicate that the plants which showed injury were those of which the stems were just shooting up at the time the eggs were laid. At the same time, it must be remem-

bered that there is on spring wheat in spring an early attack at the roots similar to that on fall wheat in autumn, by which very large numbers of wheat plants are destroyed without making stems at all. This attack is, as a rule, not noticed by farmers, because the plants which are left living, stool out more and fill up the gaps.

In a field which I had under constant observation during the summer of 1890, many plants were entirely killed by the spring attack, and others bore only a single weakly stem, most of the shoots having been destroyed; but, from the stooling of the uninjured plants, the general appearance of the field was that of a fair crop, and none of the straws could be found containing puparia, showing that all the eggs were laid before the plants began to shoot. Without close observation this attack would have been overlooked and would not, in all likelihood, have been noticed by farmers. Nevertheless the puparia of the insects which had done the harm, were still in the fields to emerge later and carry on the injury. This same state of affairs may have been the case in Manitoba last year, and much injury then done which was unnoticed. Although not detected, the Hessian Fly must certainly have been present in Manitoba in considerable numbers last year for eggs to have been laid over such a wide area. I have no doubt from an examination of specimens collected in various parts of Manitoba last autumn, that in that province there is only one brood of the Hessian Fly. This insect confines itself in a remarkable degree to the wheat plant, and, although barley and rye are occasionally attacked, this is exceptional; the very rare occurrence of pupæ in timothy, which has been recorded, must be regarded as quite accidental. No fall grain of any kind is grown in Manitoba, and puparia formed in the straws last summer still (December 30, 1899) contain living larvæ in good condition.

Prof. F. M. Webster, the author of most valuable studies on wheat pests, has maintained for many years that the Hessian Fly would be found to be single brooded when a point sufficiently far north or south of its metropolis, or centre of distribution, was reached, the extremes either of cold or heat preventing the production of food in suitable condition for the second brood, the summer brood instead of emerging in autumn hibernating as flax seeds in the north and in the south remaining in a quiescent condition (æstivating) as flax-seeds during the hot dry period of the protracted southern summer.

This theory of the insect's power to adapt itself to varying conditions was explicitly set forth by Prof. Webster in Ohio Bulletin No. 51, 1893, and as late as March last the same author writes:—'As you know, I have always questioned the occurrence of a second brood of Hessian Fly so far north as North Dakota, but I have never had an opportunity to substantiate my position. I had hoped that you might settle this Hessian Fly problem, and put the question to rest once for all with respect to the number of broods. The insect certainly occurs in areas where there is no fall wheat, but an abundance of spring wheat, and it does not seem to me possible that it could survive in such localities if it were double-brooded, as there is nothing on which a fall brood could winter over, except the spring wheat stubble.'

The importance of exact knowledge as to the number of broods is seen to be very great when we come to a consideration of remedies. The severity of the attack during the past season and the interest which has been created in the subject, through the agricultural journals, added to the fact that the weather has been most propitious this year for autumn work, have induced farmers to make themselves acquainted with the natural history of the Hessian Fly, and to adopt the methods which experience has shown are the best: namely, to burn over the stubble when possible before ploughing, and, at any rate, to plough down deeply all stubble this autumn or before the season for the flies to appear next spring.

As Mr. Greig has stated in the *Farmer's Advocate* for October 20:—'Whether or not the stubble is burned off, the land should be carefully ploughed. Even with no Hessian Fly, careful ploughing is really one of the great essentials to a successful crop. The work cannot be too well done. Not only does good ploughing leave the land in better shape and kill more weeds, but it greatly reduces the amount of harrowing and after work necessary to get the land into the best condition for the seed; and no doubt grain that comes away vigorously and early, and makes rapid growth, has more chances of escaping this or any other pest.'

The following article was published in the *Farmers' Advocate* for September 15, 1899, and similar articles were prepared for the *Nor-West Farmer* and other Manitoban papers :—

THE HESSIAN FLY.

During the past season rather extensive injury has been wrought by that old-time enemy of the wheat-grower, the Hessian Fly. From Western Ontario comes intelligence of the worst attack upon fall wheat, and the question is asked by some farmers there, whether it would not be well to discontinue altogether for a season the cultivation of fall wheat. The most serious injury and the attack of by far the greatest importance as pointing to future possibilities of loss from the Hessian Fly is reported from the Province of Manitoba, by Mr. George H. Greig, the Manitoba editor of the *Farmer's Advocate.* Inquiries and specimens have been received from almost all parts of the province, and from as far west as Moose Jaw in the Territories. Correspondents estimate the loss at between 5 and 20 per cent. This, of course, is all in spring wheat, as in the west no grain is sown in the autumn.

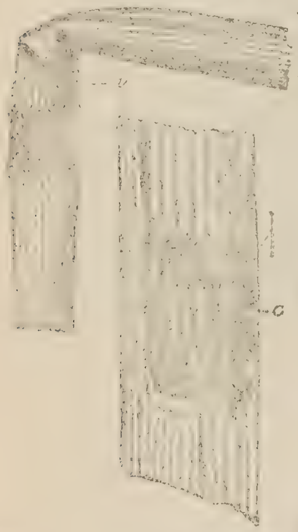


Fig. 3.—Hessian Fly: injured wheat-stem; three puparia enlarged.

The life history of the Hessian Fly is well known. The effects of the injurious work of the maggots on fall wheat can be recognized in the spring of the year by one or more dead shoots or whole plants in wheat fields. Upon examining these plants the characteristic pupa-cases, which resemble closely small elongated flax seeds, may be found in the crowns of the injured plants. Sometimes three or four specimens will occur beneath the leaf-sheaths of a single shoot. The flies from this brood emerge in the spring and lay their eggs upon the leaves of the shooting grain, and later, as at the present time in Manitoba, the same flax-seed-like pupa-cases described above and shown at Fig. 3 may be found above (as a rule, but occasionally higher), the first or second joints of the stems of barley, rye and wheat, where they lie between the base of the leaf-sheath and the stem, somewhat sunk in the tissues, so as to give the appearance of being actually inside the stem. During their growth the maggots have lived at the expense of the wheat plant, sucking the sap, so that the stems are weakened and frequently fall down, bending over just above the point of attack. This is well shown at Fig. 3*a*, and by it the presence of this enemy will probably be recognized by many Manitoba farmers who may have overlooked it in their crop. In Manitoba, it is most probably the case that there is only one brood of the Hessian Fly in the year, the winter being passed in the 'flax-seed' condition, for the most part in the stubble, but also to some extent in the straw which was harvested. Further south than Manitoba there are two distinct broods.

The perfect insect, a tiny blackish gnat, not expanding more than a quarter of an inch from tip to tip of its wings, appears in May and June and lays its eggs, which produce the summer stem-attacking brood. In Manitoba the flies from this brood do not emerge until the following spring, but in Ontario they appear in August and until about the middle of September, and the females lay their minute scarlet eggs upon the inside crease of the leaves of early-sown fall wheat. The young maggots, upon hatching, work their way down to the axils of the leaves, where the injury to the plant is done. Most of these maggots become full grown before winter sets in, and assume the 'flax-seed' condition.

Remedies—1. Late sowing.—With regard to fall wheat, the postponement of seeding until after the third week in September delays the appearance of the young plants above the ground until all the egg-laying flies of the second brood are dead. In cases where fall wheat has been sown in August and is already well up, it will be well this year, in such localities as the Hessian Fly is known to have been present, to feed off the young grain with sheep. In this way many of the eggs, it is claimed, are eaten with the leaves of the wheat. Care must be taken that the fields are not cropped too closely or too late in the season.

2. Burning refuse.—Many of the 'flax-seeds' of the summer brood are carried with the straw, and at threshing are dislodged and thrown down beneath the machine,

among the rubbish, or are left in the straw. All screenings and dust should therefore be destroyed carefully, and all straw should be either used during the winter or burnt before spring.

3. Fertilizers.—When it is known that a young crop of fall wheat has been injured by the Hessian Fly, it is a good plan to apply, the following spring, a light dressing of some quick-acting special fertilizer in order to invigorate the plants.

4. Treatment of stubble.—As the Hessian Fly is undoubtedly restricted in Manitoba to the summer straw-attacking brood, the remedy is simple, and, if persisted in, I cannot think that the Hessian Fly need ever become a serious menace to western wheat-growers. The insects passing the winter for the most part in the stubble and not appearing until the following spring, when there are growing wheat plants for the females to lay their eggs upon, if the stubble be burnt over or plowed down in autumn and the straw fed to stock or burnt at any time before the flies emerge in the spring, this dire enemy of the wheat-grower should be easily controlled.

It was to be expected, as stated in my last annual report (*Exp. Farm Report*, 1898, p. 174), that at no very distant date we might have trouble from the Hessian Fly in our western wheat fields, for Prof. Lugger has recorded that in the Red River valley, in Minnesota, where the conditions are similar to those of a large part of Manitoba, a large area of that state was infested in 1896, the damage in some places amounting to more than 25 per cent, and that on an average the farmers lost from 5 to 10 per cent of their entire wheat crop.—J. FLETCHER.

Fig. 4.—Hessian Fly: puparium containing six cocoons of *Polygnotus hiemalis* —enlarged.

Fig. 5.—*Bæotomus destructor*, female—enlarged.

One of the chief reasons why the Hessian Fly has not been very injurious in Minnesota since 1896 is, Prof. Lugger thinks, the abundance of parasites which appeared in 1897. A few of these friends of the farmer (*Polygnotus hiemalis*, Forbes) have been found in infested straws sent to me by Mr. W. W. Fraser from Emerson, Man. Three specimens of the most important parasite of the Hessian Fly, *Bæotomus (Merisus) destructor*, Say, were bred by Professor Lugger from straws sent to him by Mr. Chas. Braithwaite from Portage la Prairie. It is to be hoped that these parasites will increase largely in numbers. Unfortunately, however, Professor Lugger writes under date October 20, that in Minnesota 'Parasites of the Hessian Fly, are decidedly scarce this year. From 40 different places (about 75 infested straws from each) I have raised less than 25 parasites. Nearly all of them came from straw obtained from near Crookston, Polk Co., Minn. South of that place I have found none, north but a few.' Manitoba material received from Mr. Braithwaite contained three specimens of the females of *Bæotomus destructor*. On the other hand, in Prince Edward Island a much more satisfactory state of affairs may be reported; for, from a packet of infested straws from Mr. Wyatt received during 1898, no less than five different kinds of parasites were reared, viz:—*Bæotomus destructor*, *Eupelmus Allynii*, French, *Eupelmus*, n. sp., *Tetrastichus productus*, Riley, and *Entedon*, possibly *E. metallicus*, Nees. Cuts 3, 4, 5 & 6, used here have been kindly lent by

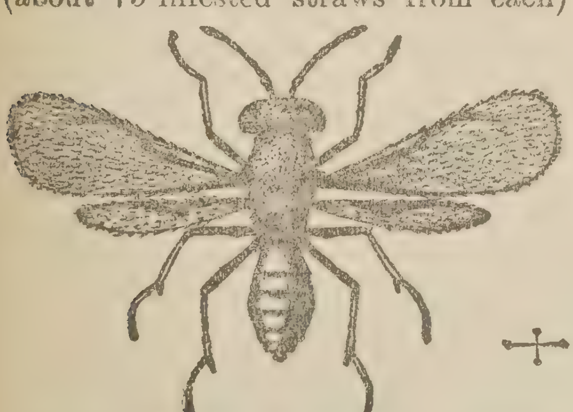


Fig. 6.—*Eupelmus Allynii*, male—enlarged.

Prof. Lugger. Reports from Prince Edward Island this year mention serious injury by Hessian Fly ; this is most probably owing to the increase in the numbers of these parasitic species.

THE DESTRUCTIVE PEA APHIS

(*Nectarophora destructor*, Jnsn.).

Attack.—Pale green plant-lice with legs darkened, particularly at the joints, honey tubes very long ; clustered in enormous numbers at the tips of the shoots, beneath the leaves, and sometimes over the whole plants of field peas, as well as upon the flowering Sweet Peas. These insects appear suddenly in large numbers and very soon kill the plants by sucking their sap. The winged specimens are rather large for aphides, being about one-eighth of an inch in length, with a wing expanse of nearly one-quarter of an inch.

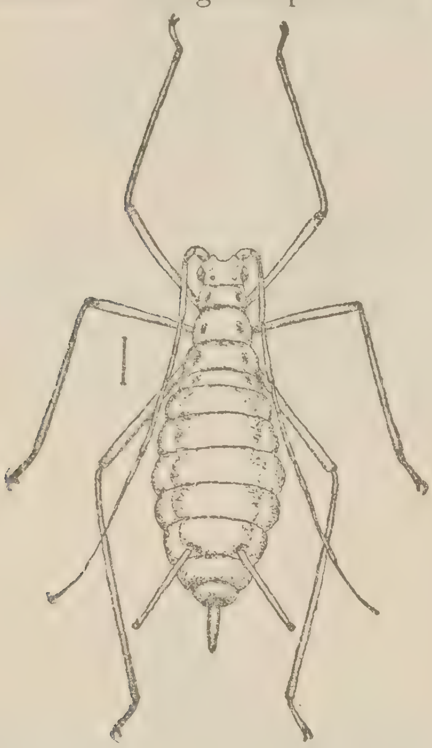


Fig. 7.—The Destructive Pea Aphis : wingless viviparous female—enlarged.

One of the most remarkable outbreaks of the year, which extended over a very wide area, was by a previously undescribed species of plant-louse. This was reported from various places in Canada from the Maritime Provinces to Western Ontario, even extending up into the sparsely settled country in the Nipissing District. It also occurred in destructive numbers in many parts of the United States ; Prof. Johnson, of Maryland, the describer of the species, who read a paper on the subject at the last meeting of the Association of Economic Entomologists, says:—

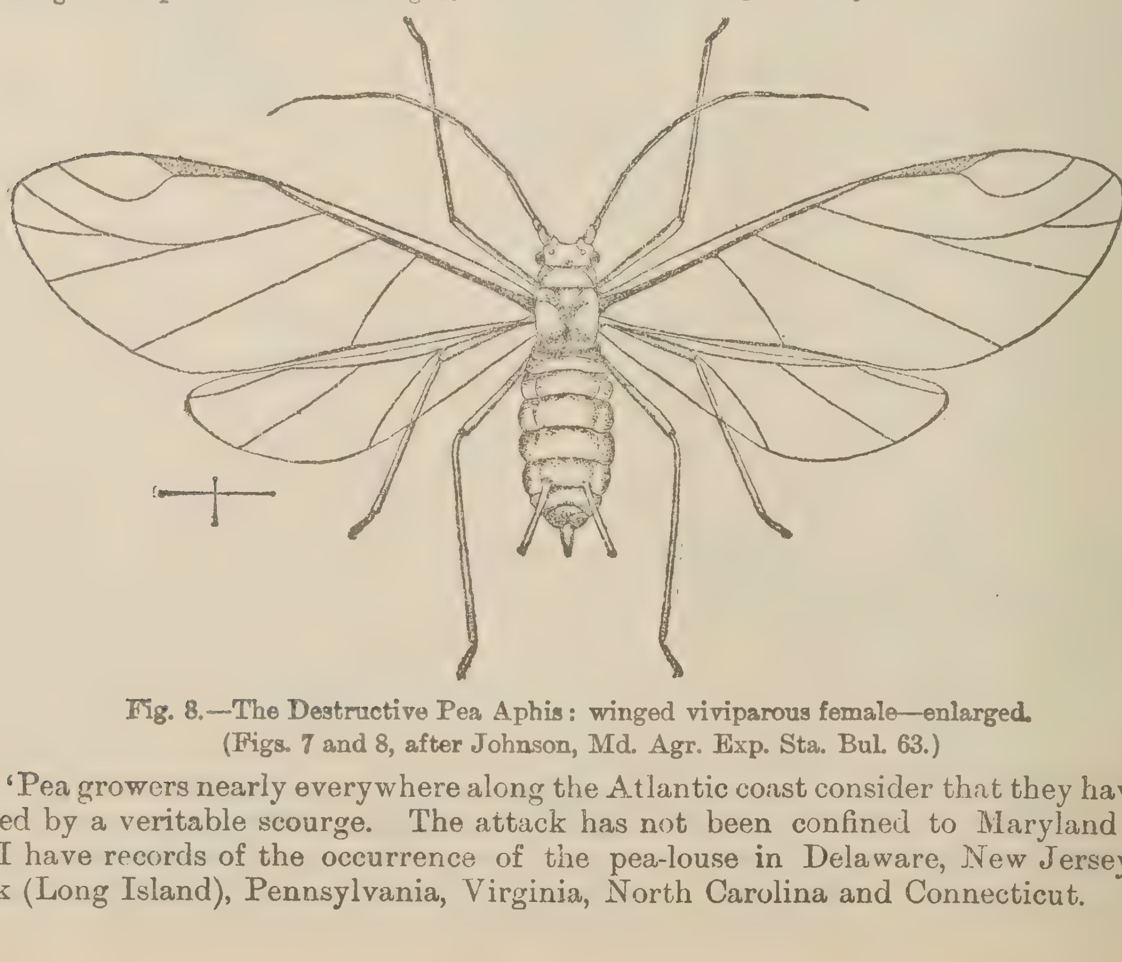


Fig. 8.—The Destructive Pea Aphis : winged viviparous female—enlarged. (Figs. 7 and 8, after Johnson, Md. Agr. Exp. Sta. Bul. 63.)

'Pea growers nearly everywhere along the Atlantic coast consider that they have been visited by a veritable scourge. The attack has not been confined to Maryland alone, but I have records of the occurrence of the pea-louse in Delaware, New Jersey, New York (Long Island), Pennsylvania, Virginia, North Carolina and Connecticut.

'The growing of peas in Maryland is a very important industry, and reliable conservative authorities place the loss this season at $3,000,000, the principal cause being the pea-louse. In many cases the destruction was complete, varying from mere garden patches to hundreds of acres.'

The Destructive Pea Aphis appeared in alarming numbers in the United States this year much earlier in the season than was the case in Canada, and consequently the loss to pea growers was greater, because in Canadian fields the seeds inside the pods in some instances had become fully formed before the Aphis appeared. By the end of May in Maryland many acres of peas were already destroyed, but in Canada it was not until the very end of July that the first complaints of injury began to be received.

The following extracts from some of the letters of correspondents will give an idea of the suddenness with which this insect appeared and the extent of its injuries :—

'Alberton, P.E.I., Oct. 31.—It appeared as if nature had striven this year to multiply aphides to infest every kind of plant. All the fruit trees were infested, the whole range of garden truck had its load, and out in the fields they so mutiplied on peas sown without grain as to flatten vigorous crops to the ground and completely ruin them. The rain prevented the kerosene emulsion from doing its work.'—Rev. A. E. Burke.

'New Minas (Kings Co.), N.S., July 29.—I observed to-day when walking through my peas, that there were swarms of active flies somewhat resembling house flies, only very shiny. (These were evidently Syrphus flies, the larvæ of which do such good service by feeding upon plant-lice, as stated further on.—J.F.) On looking closely, I found that the vines, including the young pods, were all covered with creeping insects. I send you some of these, and shall be glad to know anything you can tell me about them, for I fear that they will destroy the crop.'—Budd Bishop.

'Nappan (Cumberland Co.), N.S., August 8.—I send you samples of the work of the insect which is destroying our peas. I am very much afraid that it is going to ruin completely our experimental pea plots. These insects increase and spread with amazing rapidity. On Aug. 2, I went carefully over all the pea plots and noticed that there were a few of these insects distributed all over them. By the 6th they were in great numbers in spots all over the field, and now, two days later, they cover the whole vines, so that the whole crop will surely be ruined. The lice cluster upon, and completely hide the tender parts of the stalk, the blossoms and the under surfaces of the leaves. On account of their being mostly on the undersides of the leaves, it is hard to get at them with any kind of spray. This aphis seems to be very much like the one we sometimes have on plum trees, but it is now much more numerous than anything I have ever seen on plum trees, for these literally cover the whole field and they only take about 10 days from the time they first appear to suck the life out of the plants and leave white dead stalks. I am afraid this is a very serious matter for our pea crop.'—R. Robertson, *Superintendent Expt'l Farm.*

Later in the season Mr. Robertson wrote under date of Dec. 15: 'The worst insect of the year with us was the Pea Aphis which was not only extremely abundant and destructive on our own farm; but judging from the number of inquiries by visitors at Nappan, about what was termed in a general way 'the blight,' it must have been very prevalent in many parts of New Brunswick and Nova Scotia.'

'Adamsville (Kent Co.), N.B., Aug. 18.—I send you herewith a stalk of pea covered with insects. All the fields of peas around here are covered with them and they kill the peas outright. I have a field infested; when I first noticed them was when the peas were in blossom. They appeared to be withered, so I examined them closely and found that they were covered with these little insects. The plants are now all withered and look as if they were rusted. I have found the insect also on vetches here. I inclose you a sample of these also; they are destroyed in the same way as the peas. I am cutting them at once for fodder. I would like to know if it will be injurious in any way to feed these vetches to cattle or horses. This enemy of the pea and vetches has never been noticed in this section before.'—A. J. Arsenault.

'Elmhurst (King's Co.), N.B.—Our field peas shortly after the formation of the pods became infested with green lice, which were to be found on all parts of the plants,

but especially thick on the pods. The plants then turned brown and dried up so as to be useless as fodder. Is there any remedy for this pest? Would it be any benefit to have the next crop at some distance from the one infested?'—C. R. PETERS.

'Thornloe (Nipissing District), Ont., Sept. 14.—My crop of peas was entirely ruined by plant-lice about half the size of a grain of wheat, which were on the plants by millions. These peas were the first ever sown on my farm, as I only came here last fall. I would like to know if this pest is often found in open country. The clearing in this part amounts to only a few acres here and there, in an immense forest of rather light young timber. If it had not been for these lice, my peas would have been a good crop, as the land suits peas, so far as they have been tried by my neigbours.'—SAMUEL REID.

'Toronto (York Co.), Ont.—I am greatly troubled this summer with green-flies, upon my sweet peas. They are in great numbers; I never saw so many as there are this year When I went along the vines with the spray from the hose, they would fall on the ground so thickly as to make it green. There was another kind which attacked the plants under the ground clinging to the roots. This is of a brick red colour but otherwise resembles very closely the green-flies which were so numerous on the leaves and stems. When I pulled up some sickly vines last summer, I also found some of these insects clinging to the roots. These latter are not so numerous as the green ones mentioned above. Wireworms, cutworms and red spiders have also given me a great deal of trouble on my sweet peas this year.'—ED. LEADLEY.

'Freeman (Halton Co.), Ont., Aug. 7.—I send a sample of peas heavily infested with plant-lice. These are from a 14-acre field belonging to my cousin, F. W. Fisher, at Burlington, close to here. This is a fair sample; I have never seen anything like it before and should like to know if it is common. I should like to know what variety of aphis this is, for it looks as if the whole crop would be lost.'—GEO. E. FISHER.

This pea aphis was also very destructive to both field peas and Sweet Peas at Ottawa, but in the case of the field peas the outbreak occurred so late in the season that most varieties ripened before much harm was done. Sweet Peas in many gardens were badly attacked. Perhaps the worst case of infestation was upon a hedge of Sweet Peas planted rather late upon the Central Experimental Farm, where an excellent opportunity was afforded of watching the development of the plant-lice and also of a war which was waged strenuously against them by various kinds of parasites. The plant-lice clustered thickly around the young shoots and towards the ends of the branches, stunting the growth of the plants very much and preventing them from flowering. They appeared at Ottawa in the middle of August, and some specimens could be found right up to the hard frosts of late autumn. By the beginning of September several kinds of predaceous insects, such as lace-winged flies, lady-bird beetles and Syrphus flies, began to appear in large numbers, and from that time on the numbers of the plant-lice decreased rapidly. When the lady-bird beetles began to pupate, they crawled up above the vines and attached themselves to the wire netting intended for the sweet peas to climb over. This they studded so thickly as to be noticeable from a considerable distance. The species which were most numerous were *Hippodamia convergens*, Guér., and *Coccinella 9-notata*, Hbst. Next to these were the larvæ of *Syrphus ribesii*, L. This latter, however, was unfortunately rather commonly attacked by the hymenopterous parasite *Bassus lætatorius*, Fab., which again in its turn occasionally fell prey to the small Chalcid *Isocratus vulgaris*, Walk. In addition to the above parasites many specimens of *Praon cerasaphis*, Fitch, were bred from material collected at Ottawa. In one garden another minute Braconid, a new species of *Aphidius*, which has been named by Mr. Ashmead, of Washington, *Aphidius fletcheri*, did good service. The empty shells—the bodies of the hosts—from which the parasites had emerged, were very abundant on the plants. These hymenopterous parasites were kindly identified by Dr. Howard, U.S. Entomologist.

I had not an opportunity to examine material from all the localities at which this plant-louse occurred in Canada during the past summer, but parasites in numbers were found at most places; and, if the Ottawa outbreak may be taken as a guide, added to the fact that although so injurious this year the Destructive Pea Aphis has never appeared in destructive numbers before, we have reason to hope that even next year it may not again be the cause of serious loss. It must be noted, however, that the occur-

rence of the parasites seems to have been extremely restricted as to locality. The *Aphidius* mentioned above was very abundant in the garden of Mr. Collingwood Schreiber at Ottawa, while hardly a specimen could be found at the Central Experimental Farm, only two miles distant, where another parasite, *Praon cerasaphis*, took its place as the abundant species. Prof. Johnson, who has made careful studies of the insect in the United States, expressly states that he has been unable to secure a single true parasite from the many hundreds of specimens he has attempted to breed. On the other hand, he found the predaceous insects feeding upon them in some localities in extraordinary numbers. Speaking of the larvæ of one of the Syrphus flies, or Hovering flies, as they are sometimes called, he mentions one instance, as reported to him by a reliable grower, that 25 bushels of the larvæ were run through his screens the last few days they were working at threshing. At the same time, hardly a Destructive Pea Aphis could be found where only a few days previously they were present in countless millions. The Syrphus flies are very active, with bodies as a rule bronzed and marked with yellow, almost like wasps. They may be recognized by their habit of remaining apparently stationary, poised in mid air for a few seconds, and then dashing off a few feet to take up another position in the same manner. The adult flies do not themselves eat the plant-lice but their elongated leech-like larvæ live entirely upon them. The eggs are laid near the colonies, and when the young grubs hatch they crawl among the plant-lice, and having transfixed one they raise it up and hold it aloft until they have sucked all the juices out of the body. They are voracious and grow rapidly, destroying a very large number of plant-lice in a day. There are several species, all of which feed upon aphides. When full grown the larvæ harden into pear-shaped puparia, and the flies emerge soon afterwards. There are several broods in a season. The lady-bird beetles are such good friends of the farmer and gardener that everybody ought to know their appearance, but there is never a year passes but some one reports having taken great pains to destroy them when they have been found in numbers, believing them to be enemies. The grubs have aptly been said to somewhat resemble small alligators. The lace-winged flies also have larvæ of somewhat the same appearance, but smaller. They are armed with long hollow jaws with which they suck out the juices of the plant-lice, and are equally voracious with the lady-bird beetles. There are many points of interest about these lace-winged flies. The eggs are beautiful objects, being attached to the end of slende upright threads. The perfect insects have gauzy lace-like wings which, when not in use, are folded together like a pent-house over the back. Their eyes are bright golden bronze.

Fig. 9.—Fifteen-spotted Lady-bird: *a*, larva; *b*, pupa.

In Mr. Leadley's letter above quoted, mention is made by him of a bright red aphis found by him on the roots of his sweet peas. Specimens of this same aphis were sent in last year by Messrs. Steele Briggs Co, of Toronto, but the species was not identified from the few specimens sent, as no winged individuals could be found. Upon the outbreak of the Destructive Pea Aphis last summer it was thought that perhaps the species concerned might be the European *Siphonophora pisi*, Kalt., but Dr. Howard informs me that this latter is a much smaller species.

Remedies.—When an insect appears suddenly in the large numbers that the Destructive Pea Aphis did during the past season and increases with such rapidity, it is evident that it would be impossible to apply any remedy over such a large acreage as was simultaneously attacked, in most places where this insect occurred; but upon green peas and the flowering sweet peas in gardens the ordinary remedies used against other plant-lice were found to be quite effective against this one also. Upon the Central Experimental Farm the Horticulturist had the plants sprayed with a tobacco-and-soap wash made of 10 lbs. of tobacco leaves in half a barrel of water, the liquid from which was strained off after a few hours, and two pounds of whale-oil soap were added. When the soap was all dissolved, water was added to make 40 gallons, and the liquid was then applied with a spraying pump. Most of the plant-lice were found to be dead two

days afterwards and on such parts of the rows as received two applications, the vines were quite cleared of the insects.

THE ASPARAGUS BEETLES

(*Crioceris asparagi*, L., and *C. 12-punctata*, L.)

Attack.—The Common Asparagus Beetle—Slender black beetles about $\frac{1}{4}$ of an inch in length, conspicuously marked with six white blotches on the back and a red border to the neck and elytra, or wing-cases, appearing in the early spring and eating into the asparagus shoots, upon which they lay their greenish black eggs. The grubs, which hatch from these eggs, are dark olive and slug-like. These also attack the shoots. The Twelve-spotted Asparagus Beetle :—Occurring sometimes with the above, are beetles of about the same size, but slightly broader and of a uniform reddish orange colour, with twelve black spots upon the wing-cases. The grubs somewhat similar to those of the Common Asparagus Beetle, but of a dirty yellowish colour, feed inside the berries of asparagus.

Fig. 10.—The Common Asparagus Beetle : different stages on asparagus spray.

Both kinds of Asparagus Beetles have been common in some parts of the Eastern United States for many years. The former obtained a permanent foothold on this continent in 1856, and the latter in 1881.

THE COMMON ASPARAGUS BEETLE.—The first record of this insect, as a crop pest, in America was at Astoria, near New York city, in 1862. In a most complete article on the subject, by Mr. F. H. Chittenden in the United States *Year Book* for 1896, it is stated as follows :—"From the seat of its introduction at Astoria, forty years ago, it soon spread to the asparagus farms of Queen's County, N.Y., and by 1862 it was reported to have occasioned the loss of over a third of the crops of certain localities, such loss being estimated at $50,000."

The Common Asparagus Beetle is now found as an enemy of the asparagus plant in most of the North-eastern States, lying in the Upper Austral faunal zone. Its distribution is by means of the adult beetles flying, and by their transportation to new localities with the roots of asparagus.

Last year it was reported by Mr. A. H. Kilman (*Rep. Ent. Soc. Ont.*, 1898) that it had reached the Niagara River in the State of New York, and during the past summer it occurred in injurious numbers in the Niagara peninsula of Ontario. The first Canadian specimens sent to me were from Mr. E. Arnold, of Queenston (Lincoln Co.), Ont., and upon enquiry I learn that many asparagus beds in the Niagara district were much injured last season. Mr. John Dearness, a member of the San José Scale Commission, informed me that during 1899 he had seen the beetles abundant and injurious near St. Catharines, Ont., where also he had found that the beds were badly affected with the Asparagus Rust (*Puccinia asparagi*, DC.)

a

Fig. 11.—The Common Asparagus Beetle —enlarged.

The Common Asparagus Beetle is a narrow black beetle a little less than $\frac{1}{4}$ of an inch in length and very prettily marked. The head legs and feelers are blue black, the thorax is chesnut red, the wing-cases are mainly blue black with six silvery white spots and are widely bordered around their edges with orange red. The markings on the wing-cases have, as shown in the illustration, somewhat the appearance of a double black cross. The wing-cases are shining and bear several longitudinal lines of deep punctures. This insect injures asparagus both in the larval and perfect states. The perfect beetles pass the winter hidden beneath rubbish, loose bark of trees or stones, and appear just at the same time as the asparagus comes up, when they fly to the buds and begin to eat into the succulent shoots, upon which also they lay their eggs. These are brownish black in colour, large, compared with the size of the beetle, being nearly one-sixteenth of an inch in length, nearly three times as high as wide, and stand out in every direction from the shoots. They are attached by one end and are laid on the shoots, and later on the foliage, in rows of 6 or 7 eggs. The young grubs hatch in a few days and are grayish with black shiny heads and legs, admirably shown in figure 12 *c*. They at once attack the young shoots, eating into them, and when touched these larvæ also emit a dirty blackish fluid which soils the shoots, spoiling them for the market. They are very voracious and grow rapidly, becoming full grown in about a fortnight, when they are dark greenish-gray, shiny bag-like grubs (Fig. 12*d*), which crawl quickly but clumsily, drawing up their bodies and attaching themselves by their anal prolegs to the object upon which they are crawling. When ready to pupate, the grubs burrow into the ground and change to yellowish pupæ (Fig. 12*e*). In about a month from the time the eggs are laid, according to Fitch, the perfect beetles appear. There are probably two broods in a season in Canada. Mr. Chittenden says (*loc. cit.*): "The minimum life-cycle period of the species in the District of Columbia and southward is about three weeks from the time the egg is laid. In the colder climate of New England and in spring and summer weather the development from the egg to beetle will require from four to perhaps seven weeks. In its northern range two and perhaps three broods are usually produced, and further south there is a possibility of four or five generations each year."

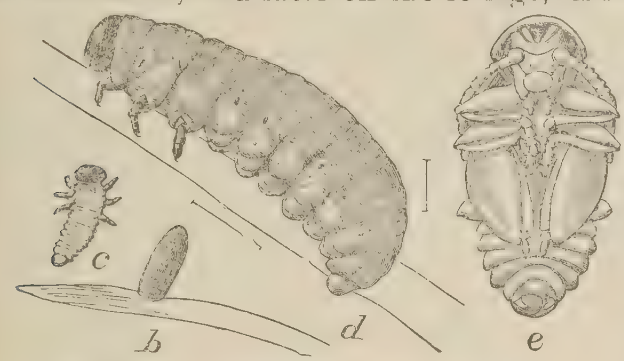


Fig. 12.—The Common Asparagus Beetle: *b*, egg; *c*, *d*, larvæ; *e*, pupa—enlarged.

Fig. 13.—Egg of Spotted Asparagus Beetle—enlarged.

THE TWELVE-SPOTTED ASPARAGUS BEETLE is about the same length as the above but is a slightly broader insect. The general colour is orange red, and the wing-cases bear 12 round black spots, the knees are also marked with black. This species was a much later introduction into America than the Common Asparagus Beetle, not having been noticed until 1881, when it was found in considerable numbers at Baltimore, Md., by Prof. Otto Lugger. It has, however, spread rapidly and now occurs with, and covers almost the same area as, the Common Asparagus Beetle.

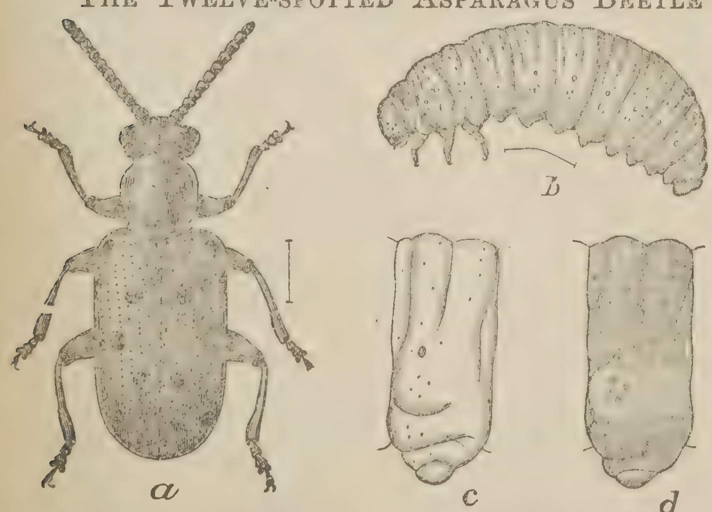


Fig. 14.—The Twelve-spotted Asparagus Beetle: *a*, beetle; *b*, larva; *c*, 2nd abdominal segment of larva; *d*, do. of *C. asparagi*—*a*, *b*, enlarged; *c*, *d*, more enlarged.

In the Canadian occurrence of these beetles during the past summer, both

species were about equally numerous on the infested beds. In the United States the 12-spotted Asparagus Beetle is regarded as rarer and less injurious than the common species. Although the hibernated beetles appear equally early in the season with the Common Asparagus Beetle and attack the young shoots, Mr. Chittenden states (*Bull. 10*, n.s., U.S, Div. Ent.) that the larvæ live chiefly in the green and ripe fruit of the Asparagus. There are, however, several records of serious injury by this species in early spring to the growing crop. Mr. Chittenden has described the eggs and the method of oviposition as different from those of the Common Asparagus Beetle (*Bull. 10*). Instead of being attached by one end and having the surface sculptured, these are attached to the plant by their sides as shown natural size and enlarged (Fig. 14). The larva also differs much (Fig. 14 *b*, *c*). Mr. Chittenden thinks that these larvæ live almost entirely in the berries, each one passing from one that it has excavated to a fresh one when in need of food. The berry drops off soon after the larva enters it, and the first brood of the beetles matures long before the berries redden on the plants. The same writer also gives the following very accurate description of some of the habits :—It is about the same size and proportions as the larva of the common species but is readily separable by its ochraceous orange colour. The ground colour is light yellowish cream overlaid with ochraceous orange ; the head, with the exception of the mouth parts, is also ochraceous. Thoracic plate dark brown divided into two parts.

Mr. Chittenden gives the following very accurate description of some of the habits of these insects :—"The Twelve-spotted Asparagus beetle, as it occurs on the plant when in fruit, very closely resembles at a little distance the ripening asparagus berries. The Common Asparagus Beetle, as is well known, dodges around a stem like a squirrel when disturbed, but the Twelve-spotted form appears to trust to flight, taking wing more readily than the other. Both species make a loud creaking sound when handled. This stridulation is produced by rubbing the tip of the abdomen against the elytra."

Figures 10 to 14 in this article have been kindly lent by Dr. L. O. Howard the U. S. Entomologist.

Remedies.—Owing to the inadvisability of applying any poisonous substances to the young shoots in spring, at the time they are being cut for the market, with the object of destroying the hibernated beetles, remedies should be directed mainly against the larvæ which appear on the plants during the summer. There are many useful measures which may be taken to control these insects :—

1. Dusting with lime.—Perhaps the most effective is the destruction of the larvæ by dusting the plants at short intervals, every three or four days, with fresh air-slaked lime, which adheres to their slimy bodies and quickly kills all those with which it comes into contact. This is best done early in the morning when dew is on the plants.

2. Arsenites.—Active poisons, as a mixture of Paris green and flour, or Paris green and lime, applied dry to the grown stems in the same way as for the Colorado Potato Beetle, answer well, and kill not only by contact with the larvæ but destroy both the larvæ and the perfect beetles when they eat the poisoned foliage.

3. Beating.—The beetles and many larvæ may be beaten from the asparagus plants into nets or broad pans containing water and coal oil. Nets made specially for the purpose are most convenient. A good pattern for an easily made net which can be held beneath the plants with one hand while the insects are beaten down on to it with a light rod, has a stick on each side and a flat sheet of cotton between, three feet wide at the top and one foot at the bottom (Fig. 15). Two cross bars close together at the base allow of this net being easily held by taking the upper bar in the left hand, so that the lower bar rests against the back of the wrist. The larvæ may also be brushed off the plant with a stick, and, if this is done in the middle of a hot day, it is claimed that few of them get back again, a very short time in the hot sun proving fatal.

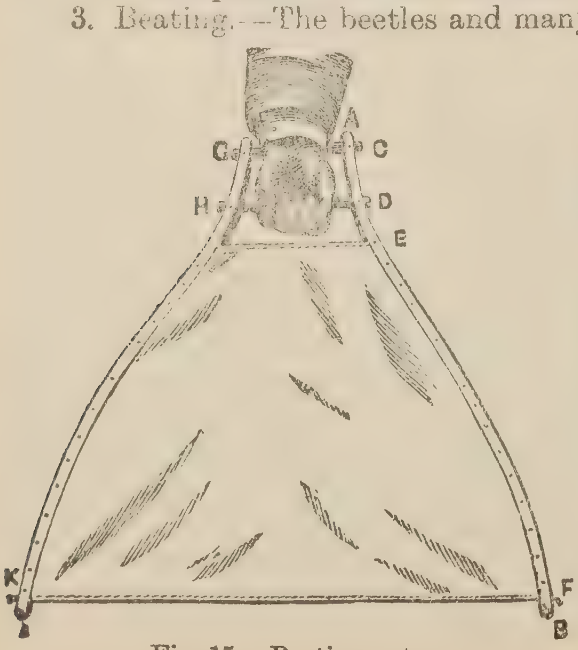


Fig. 15.—Beating net.

4. Traps.—During the cutting season the crop should be kept well down, a few shoots being left to attract the egg-laying females. In a week or so these should be cut and destroyed, other shoots being left to take their place. Young beds not old enough to be cut should be kept dusted with lime.

5. Poultry.—Chickens and ducks when available are very useful in eating the beetles when they first appear in spring, and it is claimed they do no harm to the beds.

THE BLACK VIOLET APHIS

(*Rhopalosiphum violæ*, Pergande).

Attack.—Dark coloured plant-lice clustering beneath and about the bases of the leaves and penetrating into the heart of violet plants grown under glass for winter flowering, sucking the plants and injuring them so as to prevent them from flowering, the growth being stunted and the leaves curled up.

During the convention of the Canadian Horticultural Society held at Ottawa last September, Mr. J. H. Dunlop, a large florist of Toronto and an extensive grower of violets under glass, asked what could be done to prevent the attacks upon his violet plants by the Black Violet Aphis, which he stated had been a cause of considerable loss in his greenhouses. On October 13, a visit was made to Mr. Dunlop's establishment by Mr. Arthur Gibson, of this Division, and specimens of the plant-louse mentioned were secured. These have since been bred in confinement, and specimens have been kindly identified by Mr. T. Pergande, through Dr. Howard's courtesy, as *Rhopalosiphum violæ*, a species lately described by Mr. Pergande. As a plant-louse, when examined closely, this is a very beautiful species, the body being of a brownish green, marked with black patches, and the stigma and all the veins of the wings are clearly and broadly marked with black. At the time of Mr. Gibson's visit, the aphides were very numerous, almost every plant examined in most of the violet houses being found to be infested. Very little systematic work had been done at that time towards controlling these insects. Mr. Dunlop was of the opinion that, as is known to be the case, the violet is easily injured by tobacco fumigation; consequently, little smoking had been done. Later, however, the attack became more serious and was the cause of a loss in this year's violet crop, estimated at $1,000. Fumigation with tobacco had been resorted to for three weeks at intervals of one week apart, at the time of a second visit paid by Mr. Gibson on December 26. Powdered tobacco stems had also been dusted over some of the plants. These applications had killed many of the aphides, and the insects were then practically under control, but the plants were showing many spotted leaves. The treatment of violet plants with tobacco is considered objectionable by the best growers. Mr. B. T. Galloway, Chief of the United States Division of Vegetable Physiology, who has studied the commercial culture of violets and is the author of an excellent book upon that subject, writes as follows with regard to some leaves which were submitted to him from Mr. Dunlop's houses where the fumigation had been done:—'The violet leaves are affected with the well-known spot which is very apt to appear at almost any season of the year under certain conditions. In our experience we have never found it safe to use tobacco in any form on violets; even the very weakest fumigations have a tendency to weaken the foliage and bring on spot. My suggestion in this case would be to thoroughly clean the plants, withhold water from the foliage for two or three weeks and keep a night temperature of about 40 degrees, with a day temperature of 55 or 60 degrees. In other words, attempt to give as good conditions as possible to bring the plants to health.'

Remedies.—For greenhouse plant-lice and certain other insects, the most generally adopted method to prevent such attacks is the fumigation with tobacco in its various forms. In the case of violets, however, as Mr. Galloway states, the tobacco fumigation tends to weaken the foliage and cause the 'spot' to appear. In an excellent bulletin recently issued by the United States Division of Entomology (*Circular No. 37, 2nd*

Series), the use of hydrocyanic acid gas for greenhouse fumigation is recommended, as of particular value to violet growers. Indeed this line of application of the gas is said to have been specially devised for violet houses by Messrs. Woods and Dorsett, the authors of the bulletin, who are officers of the Division of Vegetable Physiology and Pathology, and the latter is a practical violet grower. Careful and exact directions as to the proper way of using the gas, together with the necessary precautions which must be taken to avoid danger to the plants or to the operator, are given. Different plants are liable to injury in a varying degree, so that it becomes necessary to know the strength of the gas which may be used with each class of plants. Many experiments have been tried with this end in view, and directions are given in the bulletin cited for some of the leading greenhouse plants, e.g. :

'Double English Violets.—"Marie Louise," "Lady Campbell," and others. For plant-lice and general fumigation, fifteen-hundredths of a gram of 98 per cent cyanide of potassium for each cubic foot of space is required. The exposure, if made according to directions, will not hurt the plants in any stage of growth. The gas has been used on a large scale in fumigating violets for the past three years with the greatest success, only a few treatments during the season being required. Leaf-eating larvæ, slugs, millipedes, cutworms, &c., when exposed, are killed as well as plant-lice. Red Spiders, however, are not entirely eradicated by the treatment. The foliage of single violets like California and Princess of Wales are sometimes slightly injured by the stronger dose of gas. A weaker dose (one-tenth of a gram cyanide of potassium per cubic foot) should be used when they are to be treated.'

THE CLOVER MITE

(*Bryobia pratensis*, Garman).

Attack.—Reddish brown mites $\frac{1}{25}$ of an inch in length, oval in shape and with remarkably long front legs, causing the leaves of fruit and other trees, as well as of clover, to turn yellow.

This species of mite belongs to the same family of vegetable feeding mites, the *Tetranychidæ*, as the ordinary so-called 'Red Spider,' often found on house plants and in conservatories, and which also attacks orchard trees, rose and currant bushes, sweet peas, and other low plants, causing the leaves to assume a sickly appearance and to dry up. The eggs of the Clover Mite frequently come in from inquiring correspondents. They are ruby red in colour, broadly rounded above and comparatively large, about $\frac{1}{100}$th of an inch in diameter. They are usually deposited in large flat mat-like clusters in and around crotches of the branches of orchard trees, particularly of plum trees, and often in sufficient numbers to give a distinct red colour to the bark. Specimens of eggs were received first from British Columbia, and since then have come from many parts of Ontario, and as far east as Gaspé in the extreme east of the Province of Quebec.

Though spread over such a large territority in Canada, the Clover Mite does not seem to have attracted attention by its injuries anywhere except in British Columbia, until last summer, when the following letter was received :

'Queenston (Lincoln Co.), Ont., July 17.—With this I send you some twigs of some Niagara Plum trees. They are much paler green than others and are evidently affected by some insect, possibly the Red Spider. Did you ever know this insect to work on plum trees in this manner? The entire foliage of large trees seems affected. What had I better do to check it? Is it dangerous?'—C. E. FISHER.

In Canada the Clover Mite passes the winter in the egg state, but in many parts of the United States it has been complained of from time to time in the last ten years as an unwelcome invader of dwelling houses in the mature state, during autumn and winter. The small size of the Clover Mite enables it to go through ordinary wire screens with ease to the serious disquietude of the house-keeper.

The large number of inquiries about this mite, both on account of its invasion of houses in autumn and of its injuries on trees and other plants, made it necessary for the United States Entomologist to publish a special circular on the subject (*Circular No. 19*, Second Series).

Though the injuries to fruit crops by the Clover Mite have not been serious in Canada east of the Rocky Mountains, a good deal of harm is done in the Pacific States and in British Columbia to many fruit trees, particularly plums, apples, almonds and cherries, and together with other kinds of mites this is often spoken of under the general name of 'Red Spider.' Besides the injuries above referred to, there is no doubt much damage is done by this insect to clovers and grasses which is overlooked.

Remedies.—The protection of fruit trees from the attacks of this mite is not difficult where the winter is chiefly passed in the egg state on the trunks of trees. It has been found that spraying the egg masses during the winter with kerosene emulsion diluted with five parts of water will destroy the eggs without injuring the plants. Their entrance into houses in autumn may be prevented by spraying the lower portions of the buildings with pure kerosene, and, if the mites are found infesting grasses or other plants, these latter should also be sprayed with kerosene emulsion diluted with nine parts of water, to which some finely powdered sulphur can be added with advantage. When the mites have gained access to a house, they may be destroyed by the free use of pyrethrum insect powder or by burning brimstone in the room. Gasoline or benzine may be sprayed over them, but these liquids are dangerous from their extreme inflammability, and hot water frequently applied would answer the same purpose.

THE GREENHOUSE LEAF-TYER

(*Phlyctænia ferrugalis*, Hbn.).

Attack.—Slender semi-translucent green caterpillars, when full grown nearly an inch in length, with two distinct black spots close behind the head, the green dorsal vessel showing distinctly down the middle of the back, bordered on each side with a double white band, feeding inside a slight tent made by drawing the sides of leaflets together with silk threads. The cellular tissue of the lower sides only of the leaves is eaten.

During the past summer I had brought to my notice injuries to roses in the greenhouses of Mr. J. H. Dunlop, of Toronto, by the caterpillars of a small European moth, which has been introduced into America for some years and has been occasionally noticed as a greenhouse pest, and on one occasion as injuring celery out of doors in Michigan. Mr. Dunlop first noticed the work of this insect about three years ago, when it destroyed the whole of the roses in one of his houses, and did much harm in others. The only effort to control it was by catching the moths and destroying them. Every year since 1897 the caterpillars have been the cause of some loss. On October 13 last, Mr. Arthur Gibson visited the houses and saw large numbers of the moths flying among the roses and resting on the sides of the house. Living caterpillars were also found of all sizes at this time and appeared to feed almost entirely on the under sides of the leaves, eating away the soft green tissues and spoiling the appearance of the foliage. From the time they hatch until full-grown, the caterpillars live in tents made by drawing down the leaflets of the leaves; the cocoons are spun between the leaves. In a work entitled *Commercial Violet Culture* by Mr. B. T. Galloway, of Washington, it is stated that violets are sometimes attacked during the summer by this insect, the larvæ attacking the leaves and destroying the softer parts, leaving only the skeleton or frame of the tissues. The caterpillars are surrounded by a light web and occasionally two leaves are fastened together to give them protection. It is further stated that the insect never produces serious injury, but it is advisable to watch for it and take such steps for it as may be practicable. The picking of the leaves containng the larvæ is recommended and, if it should become abundant, fumigation with hydrocyanic acid gas.

A second visit was made on December 26, and although the specimens were many fewer, the houses having been carefully gone over, a moth was found flying, and a cocoon containing the living pupa, but no caterpillars. Mr. Dunlop states that the caterpillars may be found all through the winter.

The following description was taken of the larvæ :

Full-grown caterpillar,—Length at rest, $\frac{3}{4}$ of an inch. General appearance : slender, semi-translucent green caterpillars with the dark green dorsal band showing distinctly through the skin, rather fainter on 2nd, 3rd, and 13th segments. This is bordered on each side by a double white sub-dorsal band, which also is rather fainter on the 2nd, 3rd and 13th segments. On the 2nd segment are two distinct black spots, one on each side. Head one-twenty-fifth of an inch in width, smooth and shining, whitish, splashed with light brown on the cheeks, slightly furrowed at vertex, and bearing a few pale hairs. Mandibles brownish ; ocelli black. Spiracles white and very small, joined by a faint whitish line. On the 2nd, 3rd and 4th segments this line is represented by a few faint white dots and is obsolete on segment 13. Thoracic feet and prolegs of the same colour as the body ; the thoracic feet each bear exteriorily two black dots, one above the other. The whole body is sparsely covered with slender pale hairs, the ventral surface lighter in colour than the dorsal. When at rest these caterpillars have a habit of curling round to the side of the body, their heads and the first three or four segments of the body. The length of the pupal period in October was 17 days.

THE RASPBERRY WEB-WORM

(Lyda multisignata, Nort.*)*.

Attack.—Bright green smooth false-caterpillars, when full-grown over half an inch in length, which web together many of the leaves on raspberry canes, making a tent in which several of the caterpillars feed together.

A rather interesting new enemy of the raspberry has for some years occurred at St. John, N.B.; larvæ were received in 1898, from which two males and a large number of female saw-flies were reared last summer. These have been kindly identified by Dr. Howard as *Lyda multisignata*, Nort. The caterpillars when full-grown are over half an inch in length, the head round and smooth, the cheeks and back of the head chestnut brown, as well as the mandibles, and a large round patch in front of the face. Ocelli black. On the segment next to the head is the thoracic shield, which in some specimens is also darkened with brown patches, and on each side of the throat beneath, running across the same segment, from the back of the head to the bases of the first pair of thoracic feet, is a short dark brown chitinous band. Antennæ 7-jointed, and for caterpillars conspicuous. On each side beneath the last segment is also a 3-jointed antenna-like appendage protruding downwards. These appendages in *Lyda* are called abdominal antennæ by Dr. A. S. Packard in his *Text Book of Entomology*, 1898, page 165, and a figure is given of a *Lyda* larva which might almost be used as an illustration for the species under discussion. The upper flap of the last segment is rounded at the tip and bears three dark triangular marks extending from the base towards the apex, but not reaching it ; the median, only half the length of the lateral ones ; lying in a depression at the extremity, there is also a distinct median dark dot. The lower flap of the last segment, dark brown narrowly margined with green, and as well as the upper, bearing a sparse fringe of short slender bristles.

This attack was first brought to my notice by Mr. George Raymond, of Bloomsfield (King's Co.), N.B., who wrote under date August 1, 1898 :—'A friend of mine in St. John has a small garden, where she has been growing raspberries for a number of years. For the last six years they have been troubled with a worm on the leaves, at first very small, and on the under side. As they grow, they spin a web drawing the leaves all round them and destroying the foliage. They have been much more destructive this year and it is only by persistent picking of the leaves that they can be kept in check.'

Miss H. Raymond, in whose garden the injury was done, wrote a full account covering most of the facts mentioned above, but stating that the larvæ were gregarious, about six being found in the same tent, and from her account and from specimens forwarded to the Division the attack of this species upon raspberries resembles very

closely that of another Lyda which has been found in southern Manitoba upon plum trees (*Lyda rufipes*, Marl.) and was treated of in my report for 1896 at page 253.

Upon rearing the perfect insects, which emerged at Ottawa from the middle to the end of June, specimens were sent to Miss Raymond, and she subsequently wrote saying that she had often seen these flies upon the raspberry bushes about the middle of June. She also stated it was about six years since the insect had appeared in troublesome numbers, and it had been worse during the past four.

Remedies.—As these caterpillars appear on the raspberry bushes at the time the berries are forming, it is inadvisable to use Paris green and similar poisons. Moreover, Paris green has been found to be more injurious to raspberry foliage than to some other plants; if therefore poisons are used, the vegetable poison, white hellebore, is preferable, because, although very fatal to many insects and particularly to all kinds of sawfly larvæ, the poisonous principles, being very soluble, are soon washed away by rain and dew, and there is little danger in using the fruit a week after an application of white hellebore. As, however, the tent-like webs are very conspicuous and this is certainly a very uncommon insect, the method of handpicking which has been successfully adopted by Miss Raymond, will probably in most outbreaks answer all purposes.

THE APIARY.

The following report has been handed in by Mr. John Fixter upon the Apiary, at the Central Experimental Farm, the management of which as heretofore has been left entirely in his hands.

REPORT OF MR. JOHN FIXTER.

THE SEASON OF 1899.

April 1.—Eighteen colonies were removed from the winter quarters: six were placed in the House Apiary, six in the sheltered apiary, and the other six in the exposed apiary. In the case of the two last there was a considerable depth of snow on the ground, from 1 foot to 18 inches, The hives had to be watched as the snow melted to prevent them from toppling over. From April 1 to 4, there was scarcely any flying, but from the 15th to the 17th, there was much more. The hives in the exposed apiary were covered with coarse sacks as a protection, leaving a very small entrance for the bees. In the sheltered apiary and House Apiary no such protection was given. The bees in these apiaries appeared to work better than those which were exposed. On many days when the weather was cool, with cold winds, those that were sheltered were flying well, while none of the others were.

The balance of the colonies were taken from their winter quarters on April 17. All began to fly at once and no mixing appeared to take place. The colonies that were set out early were flying as well as is usual in the month of May. From April 17 to 23, many of the bees were flying every day, when the first pollen was noticed, being brought in off the swamp maples and willows. From April 20 to 30, the bees were seen gathering sap off hard maples that were running, and also off hard maple stumps where trees had been lately cut.

From May 1 to 15 the bees gathered a great amount of pollen, but very little new honey, and nearly every hive was full of brood and young bees—the first drones were noticed May 24. A considerable amount of honey was fed from May 15 to June 1, so as to keep up brood rearing and to prevent starving.

Up to June 1 there were many flowering trees and shrubs in bloom, but there was no increase in honey. From June 1 to 6, the bees were flying well, gathering pollen, but no increase in honey. On June 6 Alsike Clover came into bloom. Up to June 17 there was no honey gathered. From June 18 to 30, the bees gathered a great deal of honey from clover and raspberry.

On July 3 the first honey was taken off. July 8 the basswood trees were well out in bloom, bees appeared to be very thick on the flowers, but there was very slight increase in weight of hives; during the balance of July, bees gathered very little honey, and there was no increase in the weight of the hives after August 1. The autumn flowers gave no surplus, and there being no buckwheat sown in this district in 1899, no honey was gathered from that source.

The season being such a poor one for honey gathering, all the summer experiments have been left for another season. It is intended to test the different hives with equally strong colonies—Langstroth 8 and 10 frames, Jones hive and Hedden hive—also to test each kind for comb-honey and extracted honey; different-sized sections and further different-sized pieces of foundation in the sections.

House Apiary.

The House Apiary was again tested with two tiers of hives. This plan can be safely recommended for cities or towns where space is limited, and two tiers can be arranged just as well as one in the same building. This plan can also be highly recommended in sections of the country where the hives are continually being disturbed by boys or in any unused buildings which can be locked up.

Returns.

The past season has been a very poor one, both as to the quality and as to the quantity of honey. The returns per hive of the Central Experimental Farm Apiary for the season of 1899 show an average of only eighteen sections per colony. The colonies which were run for extracting gave 23 pounds per colony. Swarming was well kept under, very few colonies being allowed to swarm. The total number of colonies at the end of the season is sixty.

NOTES ON SUMMER MANAGEMENT OF BEES.

There is scarcely a place in Eastern Canada where bees cannot be kept profitably. There are, of course, some localities more favourable than others for the purpose, and there are certain seasons which are so unpropitious that bees have to be fed and little or no surplus honey is stored; but, on the whole, with careful management, bee-keeping may be made not only a remunerative occupation but a source of a great deal of pleasure to those engaged in it.

The keeping of bees may be practised almost anywhere, even in large cities, in towns or villages, as well as on the farm. In cities or towns the hives may be placed on the roof of any building where they get some shade, or, what is better, the hives may be kept inside a room, as explained under the head of House Apiary in previous reports. An important point, however, is to place them where they can be watched carefully during the swarming season.

I would advise placing the hives on their summer stands early in spring without waiting, as is done in many sections, until the soft maples and early willows bloom; but advantage should be taken of the first calm day when the temperature is about 60 degrees. When carrying the bees out, have weighing scales near at hand, also clean bottom boards to replace those which have been in use all the winter, and which must be cleaned before using again. Weigh at once and note the number and weight of each hive, the number for reference, and the weight to know what amount of stores is still left to carry the colony over until the honey flow. On a very warm day when there is no

wind, examine each colony and see that it has a good laying queen and plenty of stores. Should there be insufficient honey, give them a frame of honey with the cappings scraped off, placing it as close to the brood as possible, also close the entrance more or less according to the strength of the colony. If the colony is very strong, the entrance may be left about two inches in width; if weak, close down to about one-half inch. Great care should be taken to protect the hives from cold draughts in spring. As the weather gets warmer and the colonies stronger, open the entrances. On many days the bees in the House Apiary and in the sheltered apiary will be flying and gathering pollen, while the bees in the exposed apiary are at home keeping the cold air off the brood. If you have a propolis quilt or chaff cushion on the hives, leave it there until the colony is strong enough for a super for sections, or for extracting frames; then all should be removed.

The time for putting on supers is when the hive is full of bees and there are good prospects of a honey flow; by allowing plenty of room, swarming will be prevented to some extent. In this section of the country great care should be taken to see that each colony has plenty of honey during the period between the fruit bloom and clover bloom. A any failures at this time are due to lack of stores, and too much attention cannot be paid to this point. I would advise feeding if necessary up to the clover bloom to force brood-rearing, so as to have the colonies strong. Excessive swarming may be forced or prevented as desired.

If swarms are desired, crowd the bees and stimulate them with syrup. I would not advise allowing more than one swarm from each colony. To prevent excessive swarming give the bees plenty of room and do not wait until they swarm, but put on the supers as soon as the colony is strong enough to work in them. Should swarming occur, remove the hive to another stand, take a new hive, put the swarm into it and place it on the stand from which the swarming hive was removed. The old colony may be further weakened by taking out several frames and shaking all the bees off in front of the newly hived swarm.

For hives placed in a garden choose some convenient place near the dwelling where those busy about the house can see any swarms as soon as they leave the hive and settle. It is better to locate the hives away from the immediate proximity of high trees because when the bees swarm they are apt to settle too high up to be secured without much trouble. When gathering a swarm, a most important help is Manum's wire cloth swarming device, or a similar one, even a large pail attached to the end of a pole, will answer. The use of these will save many swarms and many stings for the operator. The pole may be made in joints so as to allow of extension to the required height There are many patterns of swarm collectors, most of which consist of a ring of stout wire about 2 feet in diameter, bearing a bag of some light material of about 2 feet in length. This is put up beneath the swarm and the bees shaken into it. It is then lowered and the bees are emptied out in front of a new hive, already prepared for them.

Swarms which settle on shrubs, are much more easily handled. All that is required is to take a piece of sacking, spread it on the ground under the swarm, place the hive properly prepared on the sacking, give the limb or shrub a sharp jar, when the swarm will drop in front of the hive and at once enter it. Another excellent plan is to take a frame of drawn comb or a frame of unsealed brood, and draw it up against the swarm; a large majority of the bees will soon gather upon the frame, which should then be placed in a hive with several more frames. Those bees which have already clustered on the frames will begin to call their companions; as soon as a few have found the entrance they will announce their discovery by the usual vibration of the wings ('humming'). Should the swarm still cling to the tree or shrub, a bunch of grass or a twig from an evergreen is useful to brush them off with. The hive should be left until the bees have all entered it, and as soon as they have done so, the hive should be carried to its permanent location in the apiary. If the colony is a strong one and the season favourable, place at once on the hive a super or extracting frames. When the honey flow and swarming seasons begin, everything should be in readiness to receive the swarms. Supers should be filled with sections, each of which is provided with a full sheet of foundation, and the extracting frames should also have full sheets of foundation in them, and must be

wired so as to prevent the heavy combs from breaking when the honey is being extracted. Even in the brood frames, full sheets of foundation are preferable, except perhaps for some expert apiarists.

The time to remove section honey is when the supers are fairly well filled and capped; it is best not to wait until the corner sections are filled, as these if not full enough may be put back into the next super. When removing the section honey, start shortly before sundown, smoke the bees at the entrance, then take a wide chisel and gently pry off the super and stand it on end, close to the entrance of the hive; leave it there a short time, then remove it to the honey room, leaving the doors and windows open all night for such bees as still remain on the comb to escape. By the following morning all the bees will have either returned to the hive or gone to the fields. The doors and windows of the honey room should be closed very early the next morning, or robbing will take place. Comb honey should not remain on the hive to be daubed after the sections are sealed. Remove the honey to a very warm dry room, where it will ripen thoroughly. The extracting frames may be left on the hive to ripen until the busy honey season is over; they may be tiered up two or three high. When an empty super is added, put it at the bottom next to the brood chamber. When removing extracting frames, a bee-escape is placed between the extracting super and the brood chamber, and at night the bees will descend through this but cannot return again, When all the bees are down, remove the frames to the extracting room. All honey, whether in comb or extracted, should be kept in a warm, dry room.

JOHN FIXTER.

THE WORST WEEDS OF THE NORTH-WEST.

Strange as in may seem, it is no easy matter to decide off hand what is the *worst weed* in a district, and even in a single locality there is frequently great diversity of opinion on this point. Judging from the replies of correspondents, the 'worst weed in the district' seems to mean the one plant which has given most trouble at a recent date to the farmer who happens to be interrogated.

There are, however, certain plants which, for one reason or another, every year prove to be troublesome and aggressive enemies of the farmer, causing loss of crop, necessitating extra labour, or compelling him to treat or utilize his land in a way other than he would wish.

From a close study of this subject in the West during the past five years and after consultation with the energetic and competent Weed Inspectors of Manitoba and the North-west Territories, Messrs. Charles Braithwaite, of Portage la Prairie, Man., and T. N. Willing, of Regina, N.W.T., respectively, it seems to me that the following plants are specially noxious, and every effort should be put forth to destroy them when detected, or to prevent their introduction to new localities.

STINK WEED or Penny Cress (*Thlaspi arvense*, L.), miscalled sometimes 'French Weed.' Annual. Introduced. A most pernicious and persistent weed with a strong nauseous odour and which endures the lowest temperatures of the West with impunity. Young plants overtaken by winter before their seeds are formed, revive in spring and mature in June; the seeds are produced in enormous numbers, and there are two complete crops ripened every year. This plant belongs to the same natural order as the mustard and cress, the turnip, and the cabbage. The milk of cows which eat it, is tainted and unfit for food. As a field pest it is a vigorous grower, crowding the crop and robbing the land of moisture. The succulent nature of the leaves and stems render it very dificult to kill unless destroyed when quite young.

Remedy.—Plough down before the seed pods form and harrow fallow-land constantly so as to destroy all seedlings. Land for summer-fallowing upon which plants with fully formed pods occur, must be mowed over and the plants burnt before turning down.

Land under grain crops should be harrowed two or three times with a light harrow having sloping teeth or with a weeder, from the time the grain is two inches high until it is six or even eight inches. Mr. Willing says 'Stink Weed is decidedly the hardest weed we have to handle, and some of it has been found in all districts where farming has been carried on to any extent from Manitoba to the foot hills, and from the United States boundary to the Saskatchewan.'

Wild Oat (*Avena strigosa*, Schreb.).—Annual. Introduced. Closely resembles some varieties of cultivated oats, but ripens its useless hairy seeds irregularly, so that many fall to the ground before the grain they grow among is ripe, thus crowding the crop and infesting the land with a useless and aggressive weed. Mr. Braithwaite says: 'After Stink Weed, the Wild Oat has certainly done farmers the most harm this year.' There are in Canada three kinds of Wild Oats which have been introduced from Europe. The kind most abundant in many parts of the North-west and British Columbia is the Black Wild Oat (*A. strigosa*).

Remedy.—The best means of clearing land of this pest is to work it in early spring and, when many of the seeds have germinated, go over it again with a disc harrow and sow a very early variety of oats or barley, to be cut twice as green feed and then turned down. If this land can be used the following year for a hoed crop or roots it will be better than sowing grain.

Canada Thistle (*Cnicus arvensis*, Hoffm.).—Perennial. Introduced. The Canada Thistle, so-called, is extremely abundant in some of the rich lands of the Red River valley and is well established in many spots right across the continent to the Pacific. West of Manitoba, however, it is far less troublesome than many other weeds. Mr. Braithwaite says: 'I may say I am more concerned about Canada Thistle and Tumbling Mustard than any others of our weeds. The Thistle is spreading rapidly from vacant government lands north and east, and the Tumbling Mustard has spread from the North-west down through the Souris districts.' Mr. Willing views its spread in the North-west with anxiety; he says, 'Canada Thistle seems to have come to stay and is very plentiful along the northern branches of the railway, but, it is true, many other weeds as yet are giving more trouble to farmers.

Tumbling Mustard (*Sisymbrium altissimum*, L.).—Annual. Introduced. This coarse member of the Mustard Family was only introduced into the wheat fields of the West about ten years ago, but it has now spread from Indian Head, where it was first noticed, eastward through Manitoba and westward to the interior of British Columbia. Mr. Willing says 'Tumbling Mustard is now more plentiful than any other weed in south-eastern Assiniboia.' Tumbling Mustard has all the bad charac-

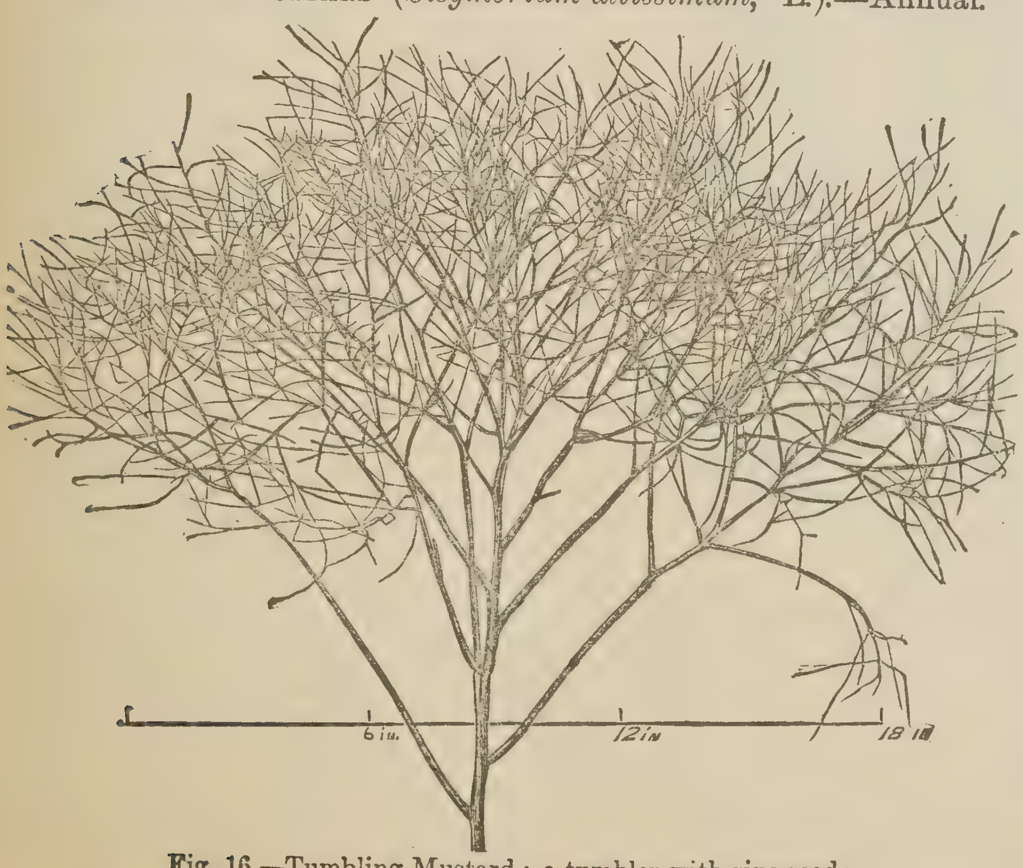


Fig. 16.—Tumbling Mustard: a tumbler with ripe seeds.

teristics of the other mustards and besides is a large free-growing, exceptionally prolific plant, of which when the seeds are ripe the head breaks off and becomes a 'tumbling weed' (Fig. 16), which may be blown for miles across the prairies in the autumn and during the winter, thus scattering the seeds quickly over wide areas. The reddish or greenish-brown seeds are very small, and a single plant produced one million and a half by actual count. Owing to the small size of the seeds, they are easily cleaned from grain. The distribution of the plant is almost entirely by the wind blowing the heads across the prairies during the winter.

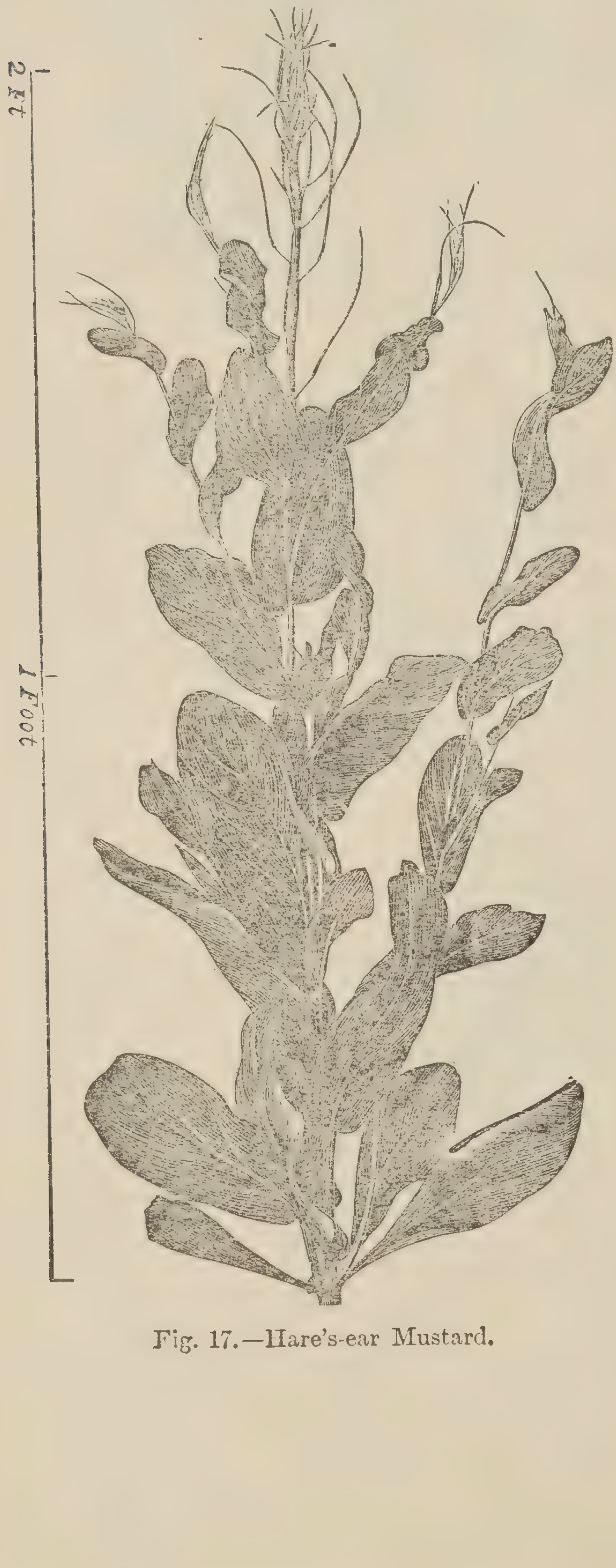


Fig. 17.—Hare's-ear Mustard.

Remedy.—The best means of clearing land of this and other kinds of mustard mentioned below consists of harrowing or cultivating with a weeder the growing crops of grain as long as possible in spring, and subsequently hand-pulling the flowering plants and mowing them down at the edges of fields, on road allowances, railway banks and waste places.

Hare's-ear Mustard [*Conringia orientalis*, (L.) Andrz.].—Annual. Introduced. This is an extremely injurious plant with large leaves, grayish-green, like those of a young cabbage or field pea, but shaped like the ear of a hare or rabbit ; flowers small and creamy white, followed by long square pods from 3 to 4 inches long, a vigorous grower and an absorber of much moisture. The ripe stems, sometimes 4 feet high, are wiry and stiff, and give much trouble when grain is harvested, not only in cutting, but also in binding and handling. The seeds of this plant are much larger than those of the Tumbling Mustard and are frequently found in seed grain, with which they are distributed. The Hare's-ear Mustard now occurs widely through Manitoba and the North-west Territories. Mr. Willing places it third in his list of the worst weeds.

False Flax (*Camelina sativa*, Krantz).—Annual and winter annual. Introduced. A slender-branched plant of the Mustard Family which matures early, the numerous pear-shaped pods containing several seeds. This is widely spread in the West. The chief causes of its increase in the past has been the late date at which summer-fallowing has been done.


FIG. 18.—Ball Mustard.

BALL MUSTARD [*Neslia paniculata* (L.) Desv.].—Annual Introduced. A tall, slender, somewhat branching, orange-flowered plant, with a great number of small single-seeded almost round pods, each one borne on a slender foot-stalk. Like the Tumbling Mustard and the Hare's-ear Mustard, this is a recent introduction into America, but has spread through the wheat-growing districts with alarming rapidity. Mr. Braithwaite says: 'This is a very bad weed as is shown by the way it has spread.' Mr. Willing writes of it: 'Ball Mustard has made more headway in Alberta and Saskatchewan in a given number of years than any introduced weed.'

WILD MUSTARD (*Brassica sinapistrum*, Bois.).—The true Wild Mustard or Charlock, also called Cadluck and Herrick, is not, compared with many others, a common weed in the West. The plant most frequently spoken of there as Wild Mustard is the Bird Rape (*Brassica campestris*, L.). The two plants may be easily distinguished. In Wild Mustard the stems and leaves are rough, the joints of the stems marked with purple, the knotted pods about one inch long on short thick foot-stalks, erect and tipped with an empty or one-seeded two-edged beak. In the Bird Rape the stems and pods are perfectly smooth and glaucous, the pods, which are from $1\frac{1}{2}$ inches to $2\frac{1}{2}$ inches in length, stand out from the stem on slender spreading foot-stalks.

SHEPHERD'S PURSE (*Capsella Bursa-pastoris*, Mœnch).—Annual. Introduced. This plant, like the Stink Weed, is frequently overtaken by winter when in full flower, but is in no way injured, the flowers and pods of the late autumn developing the following spring and producing an early crop of seeds. Few people have paid the attention to this weed in the West, which its noxious character, as it there develops, demands, and as a consequence it is increasing and spreading in an alarming manner, not only in gardens but in wheat fields. Owing to the early date at which the minute seeds develop and the enormous numbers in which these are produced, I fear this weed is going to be a cause of serious loss to western farmers. The plant is easily recognized by its rosette of cut-up leaves lying close to the ground, and bearing from the centre a much branched stem covered from bottom to top with numerous flat triangle-shaped pods. This weed is a close relative of the Stink Weed, and land infested with it should be specially attended to. The seeds are frequently too ripe by the middle of June to allow of their being ploughed down without danger. Summer-fallows should therefore be cultivated or mowed before being ploughed.

LAMB'S QUARTERS (*Chenopodium album*, L.).—Called in different places by several other names, in Manitoba most widely known as Pigweed, also as Fat-hen, Goosefoot and Wild Spinach. Lamb's Quarters, however, is the name used over by far the largest area in Canada, and Pigweed properly belongs to the common Amaranth or Red-root. The Lamb's Quarters, which is an annual plant, of which there are both native and introduced forms, the latter, however, being by far the most abundant in the West, finds in the highly fertile and slightly alkaline soils which prevail there, just such conditions as enable it to develop most luxuriantly, and it is so prevalent in some seasons as to cause a very large loss to farmers, not only in crowding out and robbing the grain while growing, but in every other way reducing the value of the crop by increasing the labour and expense of harvesting, threshing and shipping, and the subsequent and always unpopular dockage for weed seeds by the grain buyer or miller. The Lamb's Quarters prevails to so much greater an extent than any other weed that with some farmers the word 'weeds' means nothing else. It is a succulent annual which does not ripen its

seeds very early in the season; therefore, if land is harrowed before sowing and the grain sown in favourable weather, the crop, as a rule, gets well ahead and keeps the lead over the weeds, so that these do not develop to an injurious extent. In springs when there is cold weather after seeding, the seeds of the hardier weeds germinate more quickly than any of the cultivated grains, and in the constant struggle which goes on throughout the season between a crop and its weed enemies, the one which gets the best start, as a rule, holds the advantage to the end. The farmer is able to help much in this struggle to his own advantage, by using improved methods of farming suited to his own land and the variations of the season.

Remedy.—With annual weeds, the main point to be aimed at is to destroy them as seedlings and as soon as possible after the green seed leaves appear. No weed seedling can spring up on land except from a seed, and, if all weeds can be destroyed by any means before they ripen their seeds, the land, in time, must become clean. The method of harrowing growing grain lately practised in the West with excellent results is, I believe, the cheapest and best means of controlling Lamb's Quarters and all other annual weeds which every year do so much harm in western wheat fields, many of which are so large that no other manner of treating them is practicable.

WILD BUCKWHEAT (*Polygonum Convolvulus*, L.).—Annual. Introduced. In certain seasons this climbing bindweed is a terrible pest in the West, many acres of crop being entirely ruined by it. The seeds ripen very irregularly, some of them before the date at which summer-fallows are generally turned down. Western farmers, however, are wisely summer-fallowing much earlier and oftener than has been the custom in the past, and, although in this way they may increase their labour to the extent of one or even two harrowings, there is no doubt that many weeds will noticeably decrease in abundance, this abundance having been largely due to the frequency with which ripe seeds were ploughed down upon land summer-fallowed after the middle of July. Speaking of the last year or two, Mr. Willing says: 'Wild Buckwheat and Lamb's Quarters are getting away with as large a share of the farmer's profit as any of the weeds which occur here.'

Remedy.—The early and regular summer-fallowing of land every third year. Mr. Braithwaite has tried and strongly recommends a method of treating land infested with Wild Buckwheat. He says: 'I have found that, if an ordinary harrow be turned upside down so that the nuts and the tops of the teeth only protrude, a growing crop of grain may be cleaned of most of the Wild Buckwheat by simply dragging the inverted harrows across it. Of course, if a weeder is used at the right time this will never be necessary, but this weed germinates very quickly and roots deeply. When it has about three leaves, it is very tender and the harrows will break off or pull up millions of plants or check them and give the grain a chance.'

RUSSIAN PIGWEED (*Axyris amarantoides*, L.).—Annual. Introduced. This is a tall coarse-growing plant with a hard woody stem which up to the present has not given much trouble in grain fields but is spreading rapidly in Manitoba and the Territories along railways. Farmers will do well to watch it closely and prevent its increase. It belongs to the same family as the Lamb's Quarters.

COW COCKLE (*Saponaria Vaccaria*, L.).—Called also Soapwort, Cow Herb and China Cockle. A soft succulent annual with pretty pink flowers, belonging to the Pink Family, which was introduced into southern Manitoba from Europe. It has spread with rather alarming rapidity through many parts of the prairie provinces. The seeds are round, hard and black, two or three times as large as those of Wild Mustard, the surface is slightly roughened, a character by which they can be easily distinguished from the seeds of wild vetches, which are of about the same size.

GREAT RAGWEED (*Ambrosia trifida*, L.).—Annual. Native. This is the 'Crownweed' of millers. As an aggressive weed the Great Ragweed seems to be largely con-

fined to the rich lands of the Red River valley. It is a very coarse tall-growing plant, which does not ripen its seeds until late in the season. Summer-fallowing every third year and a little hand pulling during the two crop years will soon clear land of this weed. The Great Ragweed is particularly obnoxious to grain buyers and millers, owing to the difficulty with which its seeds are separated from grain, as they are of about the same size and weight as the grains of wheat and consequently cannot be easily blown or sifted out of wheat.

CANADA FLEABANE (*Erigeron Canadensis*, L.).—Called also Horseweed and incorrectly 'Fireweed.' Annual. Native. A tall wand-like plant with small greenish-white flowers, to be seen with the two common biennials False Tansy (*Artemisia biennis*, Willd.) and Common Evening Primrose (*Œnothera biennis*, L.) upon all summer-fallows. These three plants all of them flower much later than the time when land should be summer-fallowed to get the best results, both for controlling weeds as well as for the more important reason, in the West, of conserving moisture in the ground. The best remedy then for these is to summer-fallow early.

BLUE BUR (*Echinospermum Lappula*, Lehm.).—Annual. Introduced. A weed which has appeared only of late years in the West but has spread very rapidly, owing to its bristly barbed seeds. As a rule this weed is a denizen of waste places and road-sides, but it is gradually working its way into the crops. The seeds ripen about the middle of July; therefore land should be ploughed before that date to prevent the plants from seeding.

Fig. 19. Peppergrass

PEPPERGRASS (*Lepidium apetalum*, Willd.).—Native. Winter annual. A weed which occasionally appears very abundantly, particularly on light land and in wet seasons. For the most part the seeds germinate in the autumn and the seeds are produced the following season. The appearance of the plants in autumn and spring is as flat rosettes of narrow deeply indented leaves lying close to the ground with a single central tap root. Disc-harrowing in autumn and spring is the best treatment of land for this and other plants of a biennial habit.

SKUNK-TAIL GRASS (*Hordeum jubatum*, L.).—This grass is one of the most troublesome weeds in hay. Although it may when young be cut as hay and fed without danger, the hard ripe seeds often cause very painful sores in the mouths of horses and cattle, as they are very sharp-pointed and barbed. They run down by the side of the teeth, or penetrate any soft part of the mouth particularly beneath the tongue and into the tongue itself. There are two distinct forms of this grass, one with long silvery awns, 2 inches long, and another with a more erect habit which has awns little more than half that length. Various methods have been tried to clean hay lands of this troublesome pest, but none with much success. If the Skunk-tail Grass is cut when quite young, it makes tolerably good feed, and hay lands where it occurs should be mowed early before the ripening of this injurious grass. A method of cleaning hay practised at Gladstone, Man., is to toss the hay with a pitch fork on a windy day before using it, when most of the light feathery heads of the Skunk-tail Grass will blow away from the hay and may then be gathered up and destroyed. Whenever this grass is seen in waste places or roadsides it should be mowed before it is ripe and burnt.

This grass is generally described as an annual, but in Manitoba it is certainly a biennial, and apparently sometimes a perennial. It is a bunch grass and has no running root-stocks, growing only from seed.

Native Perennials.

Fig.—20. Indian Hay.

There are a few native perennial plants which are troublesome weeds on farms. Among these may be mentioned the White-stemmed Evening Primrose (*Œnothera albicaulis*, Nutt.), the Spreading Dogbane (*Apocynum androsæmifolium*, L.), the Blue Lettuce (*Lactuca pulchella*, DC.), Skeleton Weed (*Lygodesmia juncea*, Don.), Poverty Weed, or Smotherweed (*Iva axillaris*, Pursh), the Prairie Rose (*Rosa Arkansana*, Porter), and Indian Hay, or Sweet Grass (*Hierochloa borealis*, R. & S.). All of these on account of the difficulty with which they are eradicated have in different districts been stigmatized as 'the worst weed in the country.' They are all deep-rooting perennials with great tenacity of life, and the method which on the whole has given the best results, is to plough deeply in summer after the plants have drawn off a large amount from their supply of reserve material laid up by the leaves in the underground stems during the preceding summer. The broken up root-stocks, however, will still have much vitality, and if left undisturbed will throw out fresh shoots, and the land will be in a worse condition than before. To prevent this, about a month or less after the first ploughing, the land should be disc-harrowed, and this operation should be repeated again a month later, when the root-stocks of most plants will be so far weakened as to be past recovery. A few, however, as the Canada Thistle, Blue Lettuce and Sweet Grass, may require further treatment and the placing of the land under a hoed crop the next year.

Occasional Weeds.

There are every year, probably dependent on the season, certain plants which, appearing suddenly, draw general attention by their abundance over greater or smaller areas. Some of these are of little importance, but others sometimes cause considerable anxiety and loss. Among these may be mentioned the following:—

Wormseed Mustard (*Erysimum cheiranthoides*, L.).—A biennial plant with acrid principles in all its parts, the seeds particularly having caused death in cattle when fed in quantities among other seeds screened from wheat.

Small-flowered Wallflower (*Erysimum parviflorum*, Nutt.).—A native biennial, sometimes abundant in land which has been left without summer-fallowing for too long a period.

Western Wallflower (*Erysimum asperum*, DC.).—Last year one of the most conspicuous plants in some crops in western Manitoba and south-eastern Assiniboia was the beautiful golden-yellow-flowered Western Wallflower, or Prairie Rocket. This is a native biennial very easily pulled from the ground, and, although on account of its brightness it was much noticed, it can hardly be classed as a noxious weed. It very

seldom grows to a large size in crops and is easily killed by autumn or spring cultivation.

YELLOW WHITLOW-GRASS (*Draba nemorosa*, L., var. *a*, *leiocarpa*, Lindl.).—This is a small few-branched winter annual, seldom more than four to six inches high, with few leaves and a great many smooth pods about half an inch in length on slender wide-spreading foot-stalks. The flowers are bright yellow, borne at the ends of the branches. There is no danger, I believe, of this feeble native plant ever becoming an aggressive crop pest, but it was conspicuously abundant on almost every summer-fallow through Manitoba and the North-west Territories last June. At every one of the twenty-one meetings held, specimens were shown or questions were asked about it.

GRAY TANSY MUSTARD (*Sisymbrium incisum*, Englm., var. *Hartwegianum*, Watson).—Native. Biennial. A tall grayish-green slender plant 3 to 4 feet high, very leafy at the base and bearing at the summit a compressed panicle, thickly loaded with short erect pods. The leaves are very finely divided and cut up, from which fact it is sometimes inaccurately spoken of as 'Rag-weed,' a name which belong to quite a different plant. This crucifer was the most striking unusual plant on western wheat fields and summer-fallows last year, attracting the notice of everybody by its tall cones of grayish green leaves standing up above the young grain in June. Mr. Braithwaite writes: 'The Green and Gray Tansy Mustards were very much in evidence this year, but, being natives and biennials, they only showed up on breaking, summer-fallows, or in crops sown on stubble. Our farmers are now understanding the nature of the different kinds of weeds, and will in future control this kind by late fall or spring cultivation.'

GREEN TANSY MUSTARD (*Sisymbrium incisum*, Englm., var. *filipes*, Gray).—Somewhat like the last, but of a bright yellowish-green colour, and without the hoary pubescence, the branches, instead of being close together, spread loosely and form an open head, the seed pods also are borne on slender spreading foot-stalks, and the leaves are much more finely divided. A character which makes this a more dangerous weed than the last, although as yet it is the rarer of the two, is that the seeds ripen very much earlier, so that there is more danger of the ripe seed being ploughed in when land is summer-fallowed.

GOLDEN FUMITORY (*Corydalis aurea*, Willd.).—An occasional weed in Manitoba is this biennial fumitory. While in the East, where it is rather an uncommon plant on rocky banks, the stems seldom exceed 6 inches in length, in the Manitoban wheat fields patches from 2 to 3 feet across are not uncommon, and instances have been reported to me frequently of several acres of crop being choked out by it.

TARRY COCKLE (*Silene antirrhina*, L.).—A plant which could hardly have been suspected of ever developing into an agricultural pest is the slender-stemmed member of the Pink Family, to which the name of Tarry Cockle has been given. This is a plant with an upright stem bearing (in the West) many erect branches, each joint of which has a dark brown sticky patch to which dust and insects adhere. I have seen this occurring in some quantity at different places, and specimens are frequently sent in by farmers for name. Last summer Mr. Braithwaite found large patches of it in crops at Blythe, south of Brandon, in Manitoba, and the Rev. W. A. Burman saw at least 400 acres near Carberry so infested that the weed had almost crowded out all the wheat.

THREE-FLOWERED NIGHTSHADE (*Solanum triflorum*, L.).—Called also Wild Tomato. A native annual plant with deeply indented leaves, and the whitish flowers in umbel-like, three-flowered cluster, followed by green or purplish berries, about as large as small cherries; the whole plant has a musky odour, pleasant at first but afterwards very nauseous. This weed is a coarse decumbent herb forming patches 2 or 3 feet across, and is frequently troublesome in gardens and around the edges of fields.

SPEAR-LEAVED GOOSEFOOT (*Monolepis chenopodioides*, Moq.).—Annual. Native. A dark green succulent plant forming thick patches wherever soil is a little alkaline. Frequently growing so abundantly in root crops and gardens, as well as in wheat fields, as to require much labour to keep it down. The leaves of this plant are borne very thickly on the clustered stems, the lowest ones shaped like the head of a halberd or spear, but those above becoming gradually simpler in outline and smaller. Short seed-bearing spikes occur along almost the whole length of the stems.

WEEDS AND WEEDERS.

The introduction of weeders into the dry regions of the West, I consider an event of enormous importance to all grain growers. During the past five summers I have had exceptional opportunities, in driving through Manitoba and the North-west Territories, of meeting, and seeing the farms of, some of the best farmers in the West. In many places I have met men who made a practice of harrowing their growing grain crops with a light harrow, and invariably with great advantage. Upon the introduction of the various weeders these were used by a few of the most enterprising settlers, and almost always with decided satisfaction. So much was this the case that last spring several carloads of them were shipped into Manitoba by implement makers. The season of 1899, however, was so wet and late that the weeders were not used so much as would ordinarily have been the case. From what I have seen of these implements here, but particularly at the Indian Head and Brandon Experimental Farms, and from what I know to be the condition of the wheat fields in Manitoba and the North-west Territories with regard to annual weeds, I am convinced that there is more to be hoped for in the regular use of these implements after the grain is up, than from any other measure so far suggested for cleaning lands infested by such aggressive and persistent agricultural pests, as Stink Weed and the different kinds of Mustard, as well as all other seedlings growing among grain crops. Weeders can be used not only safely, but with the greatest advantage to a grain crop, from the time the leaf is an inch high until the plants have shot up 6 or even 8 inches.

One of the frequent complaints made against weeders by western farmers is that they cover too narrow a strip of the crop at a time, but in the *Farmer's Advocate* of Winnipeg for December 5, at page 612, is given a cut, which the proprietors have kindly allowed me to use here, showing a successful way of uniting two of these implements and covering 24 feet at once. In this way the writer, W. F. Baker, of Portage la Prairie, states that he can go over nealy 50 acres in a day. The two weeders are fastened together with a rope, and the horses are kept apart by a stick between the halters. The wheat in the fields reported upon, had been cultivated twice after it was 4 inches high, and he says, as has been found by many others to be the case, and as I have myself frequently seen: 'If properly used when weeds are very small, nearly all weeds can be destroyed. On July 18, the wheat thus cultivated was 4 feet high and nicely out in head. The field shown in the cut was 70 acres of the first crop after summer-fallowing. It yielded 1,800 bushels (nearly 26 bushels to an acre), and so far as shipped, graded No. 1 hard. Another 70-acre field, cultivated with the weeder, yielded 29 bushels, while a larger field, that we thought did not require a weeder, yielded only 17 bushels.'

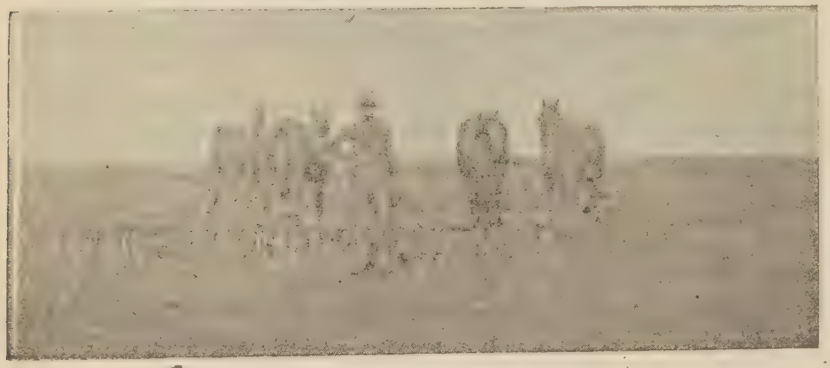


Fig. 21.—Two weeders joined.
(Cut kindly lent by the *Farmer's Advocate.*)

Mr. Angus Mackay, at Indian Head, has the greatest confidence possible in these implements, and last year used them on every acre he had under grain.

There has been considerable inquiry during the past year or two as to the treatment of grain crops infested with mustard, with solutions of sulphate of iron and sulphate of copper. There is no doubt whatever, as I have proved by experiments here and the Rev. W. A. Burman has shown in Manitoba (1898), that the annual mustards can be killed and even Stink Weed, when young, seriously injured by solutions of sulphate of copper, as weak as 2½ pounds to 10 gallons of water. On this subject I would merely point out that, at the very lowest estimate, and using the most economical effective solution yet recommended (2 per cent sulphate of copper*), $1 per acre would be the very lowest estimate at which the cost of this operation could be calculated. In the West where a good many of the farmers work several hundred acres, which they frequently never visit again after the spring work is done, until they turn in the reapers at harvest time, this extra expense including the purchase of spraying pumps and sulphate of copper, and the extra work of drawing water, and mixing and applying the solution, would be far less advantageous or likely to be practised, than the use of weeders or light harrows, which most certainly is better farming; for this operation, besides doing better work in destroying the seedlings of all kinds of weeds, has been proved to be most beneficial to the growing crops by reason of the extra cultivation thus given to the land at the very time when it requires it, and the fields so treated yield much heavier crops.

Mr. Charles Braithwaite, who has had greater opportunities of forming an opinion on this matter than any other man in Manitoba, replies as follows to an inquiry as to the utility of surface cultivation of growing grain crops :—

'PORTAGE LA PRAIRIE, Oct. 9, 1899.—I may say that, from my own observations, in ordinary years I certainly agree with your opinion. Working growing grain with light harrows or weeders has a twofold advantage: it destroys weeds and also creates a mulch which prevents moisture from evaporating. Of course, this year being a moist year, the work could not be done as effectually as in drier years. During the season of 1898, Mr. Henry Nichol, of Brandon, had two weeders and kept them going until the grain was 5 and 6 inches high. His crop averaged 30 bushels per acre, while his neighbour's did not average over 15 bushels, and some within 5 miles of him had to plough up their crop on account of weeds and drought. I had this from Mr. Nichol himself, and he is, as you know, a thoroughly reliable man. I could tell you of scores of others who have saved their crops by this method. Of course, as I tell the farmers, this surface cultivation of grain with any kind of implement must be done with common sense, not too deep nor too shallow, and, when the land is in proper condition for harrowing, not too wet and not too dry.'

THE WHEAT CROP IN MANITOBA IN 1899.

The wheat crop in Manitoba in 1899 has been estimated at 27,000,000 bushels, almost all of excellent quality and exceptionally free from weed seeds. This satisfactory result is due chiefly to the season. The late date at which severe frosts occurred allowed almost the whole crop to be got in without injury, and the freedom from weeds was due largely to abundant moisture last spring and the previous autumn. On account of cool wet weather last spring, seeding of wheat was much delayed, but the seeds of many weeds being in the ground germinated quickly and came up in the first warm days. Enormous numbers of these seedlings were destroyed at the time the grain was sown; thus the land was clean of all the weeds that had germinated, and the wheat being put in under the most favourable circumstances, germinated promptly and got ahead of the weeds. In addition to the benefit due to the wet spring of 1899, the exceptionally wet autumn of 1898 was also very beneficial by causing many of the seeds of annual weeds to germinate before winter set in, so that they were destroyed by frost These, under the usual climatic conditions which prevail in ordinary years in Manitoba and the West, do not, for lack of moisture, germinate before the following spring. As a

* See article by Mr. Shutt, page 194.

consequence of the above mentioned circumstances, the fields were exceptionally clear of weeds last spring, a satisfactory state of affairs which lasted until the end of the season.

The following extracts from letters of men who can speak with authority illustrate this point.

Mr. H. McKellar, who as Chief Clerk of the Department of Agriculture meets farmers from all parts of the province and receives reports throughout the season on the condition of the crops, says as follows :—'I have made reference on two or three previous occasions to the absence of weed seeds in this year's crop. The fact that the grain is much cleaner this year than it has been for several years is commented upon by everyone who handles grain. In fact, I might say that this year one hears nothing about dockage for weed seeds. This merely bears out the excellent appearance of the fields which we noticed in driving through them together last June and July.'

Mr. Charles Braithwaite, who as Provincial Weed Inspector travels continously over the province, inspecting crops and advising farmers how best to treat their land and avoid loss from weeds, writes : 'This is without exception the cleanest crop the West ever reaped. The climatic conditions were favourable ; last summer and fall there was moisture enough to germinate weed seeds, and then again this last spring there was a good growth of weeds before the land was fit to seed. The weeds germinated and and were destroyed in the cultivation at seeding time, and the grain came right away.'

The following report is from Mr. G. H. Greig, of the *Farmer's Advocate*, who has good opportunities of judging :—

'Winnipeg, Oct. 11—The crop generally speaking through Manitoba and the West is very much cleaner and freer of weeds than it has been for some years. The assumption is that, owing to the excessive moisture in the soil last spring, seeding was not started as early as usual, and consequently a great many weed seeds would germinate before any cultivation was given the land ; the seedlings were afterwards killed by the cultivation at seeding time. At all events, the season has not been favourable to weed growth, and crops are cleaner than they have been for years. No doubt, very much credit for this desirable state of affairs is due to the excellent work done by local department of agriculture in holding meetings during the past three years, at which the nature of weeds and the best way to fight them were explained.'

The following report by Mr. F. T. Shutt, Chief Chemist to the Dominion Experimental Farms, will be read with interest by those seeking information as to the remedial treatment of mustard with sulphate of copper and sulphate of iron. The application of these solutions may be found useful in small areas in the East or in British Columbia, but is not a practical nor advisable method to recommend on the large farms in the drier regions of the West.

SPRAYING FOR DESTRUCTION OF MUSTARD.

By Frank T. Shutt, M.A., Chemist, Dominion Experimental Farms.

One of the most persistent weeds that farmers in many parts of Canada have to contend with is mustard, commonly known in Europe as Charlock. Though an annual, it is most difficult to eradicate from fields in which it has become established, owing to the fact that the seed—of which a large number is formed—are endowed with a strong vitality and are preserved from decay by the oil they contain, until favourable conditions for sprouting occur.

Pulling the mustard when it appears among the grain, or keeping the weed from seeding by working the land (as under a hoed crop), are the two methods which have hitherto been in vogue to exterminate this pest, and when the work is done thoroughly they may be considered satisfactory and efficient. The former, however, is always costly, and the latter is sometimes not convenient. When, therefore, it was announced in the agricultural press that spraying with certain solutions of sulphate of iron and

sulphate of copper had been tried successfully in England and France, it was deemed advisable to make similar experiments here. We should then be in a position to furnish information at first hand on this subject.

The fields of the Experimental Farm being free from this weed, it became necessary to make the trials upon an adjoining farm, and for that purpose a field of barley was selected which showed a considerable amount of mustard. The size of the plot treated in each case was one-tenth of an acre, and the quantity of solution uniformly supplied to each area was 5 gallons, or at the rate of 50 gallons per acre. The date of spraying was June 26, the grain being 15 inches to 20 inches high, and the mustard practically the same height and just coming into flower. The chief data may be briefly stated as follows :—

Sulphate of Iron; 5 per cent.—No effect upon barley. The leaves were practically all stripped from the stems of the mustard, but the weed was not killed, as evidenced by new leaves subsequently starting the plant flowering and the seed-pods filling out and maturing. The leafless stems were quite green a fortnight after the spraying, and were apparently furnishing nourishment to the seed.

Sulphate of Iron, 10 per cent.—A slight scorching of some of the leaves of the barley was to be noticed. A fortnight after the spraying this was not discernible, and, though this spray may have *slightly* retarded growth, it is not probable that the yield of grain was affected.

Though the effect upon the mustard was more pronounced than in the foregoing instance, as noticed by the 'spotting' on the stems, it was not sufficiently strong to prevent flowering and the ripening of the seeds, a large proportion of which proved, upon testing, to be vital.

Sulphate of Copper, 2 per cent.—A certain amount of injury to the leaves of the barley resulted, evidently retarding growth to a somewhat greater degree than the 10 per cent iron sulphate solution. At the end of two weeks, however, this effect had practically all disappeared, and it became doubtful if there were any permanent injury to the grain. The mustard very quickly showed the effect of the spraying, both the stems and the leaves dying without allowing the plant to seed. Two weeks after spraying, a few living mustard plants were found in the plot, but it is believed they had escaped the solution, owing to the height and overshadowing of the barley.

Sulphate of Copper, 5 per cent.—This solution damaged the barley in a much more pronounced manner than the preceding solution ; in all probability it somewhat lessened the yield of grain, though, as the ground was very uneven in character, no comparative data on this point could be obtained.

The mustard was all killed ; an inspection two weeks after the spraying did not reveal any living plants.

In order to ascertain the effect of these solutions upon this weed at a younger stage of growth than that just reported upon, mustard seed was sown in rows in a plot upon the Experimental Farm. When the mustard plants had reached the height of 6 to 9 inches they were sprayed as follows :—

July 20 : *Sulphate of Iron, 5 per cent.*—Not all killed ; the few survivors possessed green stems and in time sent out new leaves. It is extremely doubtful, however, if the plants will have sufficient strength to flower.

Sulphate of Copper, 2 per cent.—All the plants died within a few days.

July 22.—Further sprayings were made : *Sulphate of Iron*, 5 per cent. The stems were stripped of all their leaves, but in the course of a few weeks fresh leaves had appeared on many of the plants. *Sulphate of Iron*, 10 per cent : Though somewhat more severely attacked than by the 5 per cent solution, there was sufficient vigour left in many of the plants to send out new leaves after a few weeks.

Sulphate of Copper, 2 per cent: Only a very few of the older and more vigorous plants escaped destruction, probably not more than three to five per cent. This solution is evidently strong enough to kill all mustard plants 6 inches in height and less.

Sulphate of Copper, 5 per cent.—All the plants killed.

From the above data, I make the following inferences:—

1. That a two per cent solution of sulphate of copper (that is, 2 pounds in 10 gallons of water) is, all things considered, the most effective, safest (as regards the grain crop) and most economical to use. The spraying should be done thoroughly, and for that purpose 50 gallons per acre will be required. If a heavy rain follows the spraying within 24 hours, the operation will have to be repeated.

2. That, in order that the work may be effective, spraying should not be delayed after the mustard plants have reached a height of 6 to 9 inches. If allowed to grow taller than this, stronger solutions would be necessary and in larger quantity, as the grain would then largely protect the mustard.

NOTES ON LECTURING TOURS IN MANITOBA, THE NORTH-WEST TERRITORIES AND BRITISH COLUMBIA IN 1899.

By instruction of the Honourable Minister of Agriculture and at the request of the several governments of Manitoba, the North-west Territories and British Columbia, I left Ottawa in June last to hold three series of farmers' meetings in the West. The subjects of the addresses delivered were chiefly as follows: In Manitoba, locusts and weeds; in the Territories, weeds and their eradication, special mention being made of the value of summer-fallowing and the use of the implements known as weeders, and nature studies and agricultural education in schools; in British Columbia, the value of Farmers' Institutes, weeds and their eradication, insects injurious to fruits, hay and pasture grasses.

Leaving Ottawa on June 10, I reached Manitoba on the 13th. Passing along the railway between Ottawa and Manitoba, the backwardness of the season was remarkably apparent. Spring flowers which had been in bloom at Ottawa a month earlier, were only now opening their buds. This lateness was also a feature of the season all through Manitoba and the Territories.

MANITOBA.

Upon reaching Winnipeg, I made an examination of the shade trees, which are such an attractive feature of this beautiful city, and found that the Ash-leaved Maples were infested by three different insects: (1.) the Negundo Plant-louse (*Chaitophorus negundinis*, Thom.), (2.) the Cankerworm (*Anisopteryx pometaria*, Harr.)—both of these although much less abundant than in former years, still required attention—and, lastly but much more conspicuous, (3.) the Fleshy Leaf-gall of the Negundo. This is a fleshy swelling on the mid ribs of the young leaves which disfigures them very much. The galls are about an inch in length and contain several yellowish larvæ of a small gnat probably belonging to the genus *Diplosis*. An article was prepared for the press under the caption of 'Spray the Trees,' which was published in the local newspapers, and many availed themselves of the advice given therein.

On June 13 I reported myself at the Provincial Department of Agriculture, and, having been joined by Prof. Otto Lugger, the State Entomologist of Minnesota, I left Winnipeg on the 14th, and with Mr. Hugh McKellar, the Chief Clerk of the Provincial Department of Agriculture, who had made arrangements for an investigation of the areas in southern Manitoba, which were infested by the Rocky Mountain Locust in 1898. We reached Boissevain on the evening of the 14th and held a well attended meeting of farmers the same evening. The first

Fig. 22.—The Rocky Mountain Locust.

address was delivered by Mr. McKellar, who explained what steps had been taken by the Honourable Thomas Greenway with a view to assist the farmers to avoid loss by locusts, which were so abundant in 1898 as to have caused considerable anxiety, and, as none of the observers who had been on the lookout for the egg-laying females last autumn had succeeded in observing any, the hope had been expressed that there would be no locusts this year. The department, however, feared that this was too hopeful a view of the matter, and, on account of the gravity of the case, the Minister had requested the Dominion Entomologist and the State Entomologist of Minnesota to visit the district and examine whether there was any probability of an outbreak of locusts in 1899. Reports had been received that the insects had begun to appear south of Boissevain and Deloraine, and, although the date at that time was three weeks later than when the locusts had appeared last year, it was considered wiser to have the matter investigated carefully, so that, if locusts were found, farmers might be visited and urged to use the methods of destroying the insects which had been found useful elsewhere.

I then followed with a statement of all that was known of the Manitoba occurrences of the Rocky Mountain Locust, the extent of the losses which might accrue if farmers did not adopt the simple and inexpensive means of controlling them which had been advised. Prof. Lugger explained in a lucid manner the life history of this locust, which he illustrated with some large and original charts and gave the results of his long experience in fighting locusts in Minnesota and Dakota. The measures advised were practically those which had already been made known widely through newspapers, agricultural journals and government reports, and were briefly as follows :—The ploughing down in autumn and spring of all stubble in the districts where locusts had been seen, the ploughing down of the young locusts with the stubble as soon as possible after they hatched, beginning at the outsides of fields and working towards the centre ; wherever the young had hatched and made considered growth before the stubble was ploughed down, the use of the hopper-dozers, and on restricted areas the poisoning of the insects with arsenical mixtures.

Mr. Charles Braithwaite, the Provincial Weed Inspector, was also present and spoke at this meeting ; he also accompanied us through the rest of our investigation, in which he was of much assistance.

Fig. 23.—Messrs. Fletcher, Lugger and McKellar finding locusts' eggs.

On the morning of the 15th we started early and drove down to the beautiful farm of Mr. A. S. Barton, and thence to Mr. Frank Thompson's, where the exact localities could be pointed out in which the locusts had occurred the previous year. No trace of the insects or their eggs was found; indeed, there was, both here and during a 25-mile drive to Deloraine, a most remarkable absence of all kinds of locusts or 'grasshoppers,' the name by which they are generally spoken of in the West. On reaching Deloraine, we were met by Mr. John Renton, of that place, and Mr. Thompson, of Waskada, who told us that hoppers had been seen on the hatching grounds six miles south of Deloraine, where I had found them last year. Accordingly, we drove to these farms, where they had been most abundant, and made a thorough search for the eggs. We soon saw that young locusts were hatching in large numbers, some were just emerging from the eggs, and some unhatched ; many egg-pods also were empty, but showed that the eggs had been destroyed by parasites. The egg-pods were about an inch below the surface, mostly on elevated spots, and on the sunny side of furrows on these elevated spots. This date of hatching (June 15) was fully three weeks later than that at which the young grasshoppers must have hatched last year, for I found fully matured insects on July 4, 1898. This was due to the late wet spring, a circumstance which also was of great benefit to farmers by making it easier for them to control weeds.

On the evening of the 15th a meeting was held at Deloraine, which was wel attended by farmers from the surrounding country, and addresses were delivered similar to those given at the Boissevain meeting, except that we were now able to speak strongly and definitely as to what steps it was advisable for the farmers to adopt without delay. At this meeting Mr. D. S. McLeod brought specimens of locusts from Lennox, only a few miles south-west of the Deloraine occurrence; these were apparently a week or more older than any we had seen in the fields we visited. At this meeting Prof. Lugger gave the chief address of the evening, describing in detail the best means to adopt under the present conditions to prevent the spread of the swarms now hatching; he also showed plans and explained thoroughly the construction of hopper-dozers, in case these implements should be required later in the season. From what we had seen, however, we were able to encourage the farmers to hope that, if all would plough down the stubbles left for summer-fallowing at once, the locusts might be prevented from spreading and causing serious loss.

After the Deloraine meeting we left for Napinka and took the early morning train to Brandon, where a profitable morning was spent examining the magnificent crops on the Brandon Experimental Farm. The Awnless or Smooth Brome Grass, the introduction of which by the Experimental Farms has been such an immense boon to the farmers of the West, was at that time (June 16) just spearing, and the meadows were a thick mat of grass, over two feet in height. In the afternoon a good opportunity of meeting many of the best farmers of the province was afforded at the ploughing match of the Blythe Farmers' Institute, held near the Brandon Hills Post Office. Here we were again invited to deliver addresses on our grasshopper investigations, a subject which proved of much interest to the hundreds of farmers present. We returned to Brandon in the evening, and on the morning of the 17th I separated from my very pleasant companions.

Owing to the excellent arrangements made by Mr. McKellar and by the generosity of the Northern Pacific and Canadian Pacific Railways who had given the whole party free transportation over their lines, we had been able in a very short time to travel a long distance and also to meet the farmers most keenly interested in the locust occurrences. That the farmers of southern Manitoba appreciated the efforts of the governments to help them, is attested by the following letter received from Mr. McKellar at the end of the season:—

'There is no doubt but that your visits to Manitoba in 1898 and June 1899, examining the Deloraine district, invaded by grasshoppers, did much good. Farmers were interested in the definite information given by you regarding the habits of the grasshoppers and the best methods for fighting them. Instructions *in re* fall ploughing or early spring ploughing and early summer-fallowing have been followed. A few farmers have used hopper-dozers this season, and if necessary, more will be used the coming year. The injury done in 1899 was not appreciable. The crops were of very heavy growth, and the harm done, therefore, not so evident. There has been more fall ploughing in the Deloraine, Whitewater and Boissevain districts last fall than in any previous year. This was partly on account of the very favourable fall, but farmers were no doubt stirred up to the work by the knowledge that they were taking the best means possible for destroying the eggs of grasshoppers that might have been deposited during the summer.'

North-West Territories.

June 18 was spent in answering correspondence which had been forwarded to me from my office at Ottawa, and on the afternoon of the 19th I left for the West, reaching Moosomin at 4 o'clock, in time to join the Honourable G. H. V. Bulyea, the Commissioner of Agriculture for the North-west Territories, and hold an afternoon meeting of farmers; this was the first of a series of seventeen meetings held in the southeast of Assiniboia. These meetings were arranged by the Commissioner to be held at the points where it was considered good work could be done by explaining to farmers living in that magnificent and fertile section: (1) the exact meaning of the North-west Noxious Weed

Ordinance and the attitude of the Provincial Government on the subject; (2) the nature of noxious weeds, the danger of many varieties being introduced from the East; and giving a detailed description of the kinds most to be feared in each locality, with the best means of eradicating or fighting against them. The order of the meetings was as follows: The Commissioner, who was present at almost every meeting, opened with an exposition of the Weed Ordinance; I followed with a treatment of the subject of weeds and their eradication, illustrating my remarks with fresh specimens of the worst weeds to be found in each locality, either brought in by farmers or collected before the meeting. There were also shown prepared specimens of those not yet introduced but which were to be feared and which might appear at any time among crops. At most of these meetings we were accompanied by, and received much assistance from, Mr. Wm. Trant, of Regina, who not only took an active part in the meetings but prepared careful accounts of each for the press, in which the chief features of the addresses were presented in an excellent manner. Some of these meetings were also rendered much more attractive and useful by the presence and timely addresses of the active Deputy Commissioner of Agriculture, Mr. C. W. Peterson, and the Territorial Weed Inspector, Mr. T. N. Willing, who is both an expert botanist and also a practical farmer who has lived for many years in the West. It will be seen by the list of places given below where meetings were held, that a large area of country was visited, the exceptional fertility of which was clearly proved by the prosperity of the farmers, as evidenced by the fine houses and buildings and the well-kept farms.

At Regina we were honoured by the presence of His Honour the Lieutenant Governor of the North-west Territories, the Honourable A. E. Forget, who took an active part in the proceedings.

The series of meetings began at Moosomin on the 19th and ended at Gainsborough on July 7. They were convened through the different agricultural societies, and in every instance an officer of the local society presided. The enthusiastic welcome accorded the Honourable Commissioner and the keen interest shown in the subject as evinced by the large attendance at all the meetings, and the animated discussions, were very gratifying. The numbers which were present were remarkably large considering the distance most had to travel, and the fact that it was necessary to hold these meetings at a very busy time of the year for farmers.

The following is a complete list of the meetings held, with the name of the chairmen:

Date.	Place.	Chairman.		
1899.				
June 19	Moosomin	J. M. L. Young, President, Agricultural Society.		
" 20	Whitewood	R. Nicholson,	"	"
" 21	Grenfell	R. D. Lake, M.L.A.,	"	"
" 22	Wolseley	Dr. Elliott, M.L.A.,	"	"
" 23	Indian Head	Angus Mackay,	"	"
" 24	Qu'Appelle	W. H. Henley,	"	"
" 26	Fort Qu'Appelle	A. Macdonald,	"	"
" 27	Regina	G. Spring-Rice,	"	"
" 28	Moose Jaw	Jno. Battle,	"	"
" 29	Fairmede	J. Clementson,	"	"
" 30	Glen Adelaide	Wm. Piggott,	"	"
July 1	Clare	J. L. Thompson,	"	"
" 3	Carlyle	Jno. Stewart,	"	"
" 4	Alameda	S. Miller,	"	"
" 5	Oxbow	D. W. Maitland, Secretary,		"
" 6	Carnduff	Jno. Young,	"	"
" 7	Gainsborough	Wm. Taylor, President,		"

After the Moosomin meeting we went by freight train to Whitewood, arriving there early in the morning of the 20th. The morning was spent in collecting plants

with Mr. T. N Willing. We took the evening train for Grenfell, where we were met by Mr. R. D. Lake, through whose kindness I was driven out to his home and had an opportunity of seeing the nature of the country and its condition as to the prevalence of weeds. The following morning further opportunities were afforded by a 15-mile drive round by the farm of Mr. T. Skilliter and back to Grenfell, where a very largely attended meeting was held, one of the best of the whole series. After the meeting I returned with Mr. Lake to Col. Lake's house, and the following morning was driven to Wolseley, where we held another good meeting in the new Court House. At Whitewood we were joined by Mr. F. Blakely, of the *Nor'-West Farmer*, who remained with us for all the subsequent meetings but the last. Owing to the much greater altitude, the crops from Moosomin to Grenfell and Wolseley were not nearly so forward as in Manitoba. Winnipeg is about 700 feet above sea level, while Grenfell is nearly 2,000. All crops, however, were in splendid condition and there was every prospect of an enormous yield, the land being, as a rule, clean and well worked.

We reached Indian Head on June 23, when I was met at the station and driven out to the Experimental Farm by Mr. Angus Mackay. During the morning the whole of our party was driven round the farm. Crops of all kinds were in the best of order, and a remarkable object lesson was here seen of the very great value of using harrows and weeders upon growing grain crops. These as a whole were much more advanced than at Grenfell, and those which had been harrowed showed this fact plainly by their greater vigour. The meeting in Indian Head in the afternoon was well attended, and, as was to be expected, summer-fallowing and the surface treatment of growing grain were much discussed. Mr. Mackay has probably taken a more active part than anyone else in the North-west in insisting upon the necessity of a proper system of summer-fallowing for the dry regions of the West, and, as a remarkable confirmation of the accuracy of his views, lands which ten or fifteen years ago were abandoned because it was stated they were too far west and too dry to produce paying crops of wheat, are at the present time selling at a higher price than any other lands in the North-west Territories.

On the morning of the 24th Mr. Mackay kindly drove me himself to Qu'Appelle station and on the way pointed out many features of agricultural interest. The meeting was held in the afternoon, and, like the next one at Fort Qu'Appelle on the following Monday, was particularly well attended, the large number of questions asked and free discussion of the addresses being noticeable features in both places.

On Monday morning June 26, through the kindness of Mr. Donald McKay, I was driven to Fort Qu'Appelle and had a chance to examine many growing crops on the way. This locality was of particular interest because it was from here that the first reports were received of the occurrence as crop pests of the Tumbling Mustard and Hare's-ear Mustard. After the meeting at Fort Qu'Appelle, I drove back to Qu'Appelle Station with Deputy Commissioner of Agriculture Peterson and Mr. Blakely through a torrent of rain and took the train at 20.20 o'clock for Regina.

The following morning was taken up by examining the barracks of the North-west Mounted Police and the successful experiments in cultivating trees and growing flowers which have been carried on for many years by Col. Herchmer. It is very seldom that one can see anywhere such beautiful sweet peas and other annuals, and as well grown vegetables as are produced at Regina in these grounds. A most successful meeting took place in the afternoon at which many prosperous farmers from the surrounding country, as well as several government officials, were present. A vote of thanks to the speakers was proposed by His Honour the Lieutenant Governor, and seconded by Mr. D. J. Goggin, the Superintendent of Education.

The next meeting was at Moose Jaw, and I was much pleased to have an opportunity of driving out both in the morning and in the afternoon to see the grand crops which are now being grown in this semi-arid district, and are due to the recent adoption of the best methods of farming for that section of country. The discussion at the meetnig held in the afternoon was mainly upon the treatment of such annual weeds as the various kinds of mustard, several of which were prevalent through the district, the Spear-leaved Goosefoot (*Monolepis chenopodioides*, Moq.) and of such deep-rooted perennials as the White-stemmed Evening Primrose, Poverty Weed (*Iva axillaris*, Pursh),

known here under the appropriate name of Smother Weed, and the Blue Lettuce (*Lactuca pulchella*, DC.).

Early on the morning of June 29 I left Moose Jaw with Mr. Blakely, and having been joined at Regina by the Hon. Mr. Bulyea, went on to Wapella, where a team was in readiness to take us to Fairmede, 18 miles distant, at which place we held the first of several successful meetings away from the railway, driving from place to place through the country. We were all much surprised at the fine agricultural hall and buildings at Fairmede, but this was soon explained by the prosperity of the farmers in this fertile district. We spent the night at the comfortable home of Mr. John Kidd, who moved out west from the Ottawa district many years ago.

The next meeting was at Glen Adelaide, 22 miles distant, and was reached after a delightful prairie drive in the afternoon. We spent the night at Cannington Manor, and leaving the next morning, were driven by Mr. McDiarmid, M.L.A., through the Moose Mountains and White Bear's Reserve, passing by Heart Hill, one of the highest mounds of these hills, to Arcola (16 miles), where we were hospitably entertained by Mr. J. L. Thompson. Mr. Thompson's farm lies at the foot of the Moose Mountains, with a magnificent stretch of level and extremely fertile land lying to the south of it. The prosperity of this section is clearly shown by the fine houses of the settlers, notwithstanding the long distance over which all produce has to be driven to market or to the railways. In the afternoon Mr. Thompson drove us 7 miles to the new village of Clare, where a meeting was held. A few farms in this district were found to be infested with Stink Weed (*Thlaspi arvense*, L.) and Hare's-ear Mustard [*Conringia orientalis*, (L.) Andrz.], which had been accidently introduced a year or two before, but which had been recognized and were being attended to. The Shepherd's Purse (*Capsella Bursa-pastoris*, Mœnch) and the Green Tansy Mustard (*Sisymbrium incisum*, Engelm., var *filipes*, Gray.) were also remarkably abundant in one or two places, and both plants were seen to be loaded with seeds. At the meeting stress was laid upon the importance of early summer-fallowing and of mowing down all weeds with ripe seeds before the summer-fallows are turned down. We afterwards drove back to Arcola with Mr. Thompson and remained with him until the morning of Monday, July 3.

Leaving at 8 o'clock on July 3, we drove 10 miles to Carlyle, where a large meeting was held in the afternoon, and subsequently 23 miles further to Alameda, on the Souris Branch of the Canadian Pacific Railway, where we were joined by Mr. Trant, and a splendid meeting took place in the afternoon, at which a great number of specimens were brought in by farmers and where there was a most useful discussion. After this meeting we walked to Oxbow, the next station along the railway, passing through the rich lands lying along the Souris River. As we neared the town of Oxbow, we found some crops of wheat in which the Prairie Rocket (*Erysimum asperum*, DC.) was very abundant, and, being such a conspicuous plant, it had naturally caused considerable anxiety among farmers who had recognized it as a member of the Mustard Family. This plant, however, is a biennial which seldom shows itself as abundantly as was the case this year, being a native plant which has never proved to be an aggressive crop pest and which besides is easily pulled up, the large plants never growing very closely together; it is not likely, therefore, to develop into a bad weed.

The meeting at Oxbow was equally successful with the preceding one. The next morning we drove to Carnduff, where we were joined by Mr. T. N. Willing. The farmers here were found to be much interested in the weed question, and the same was the case at the meeting held on July 7 at Gainsborough, many pertinent questions being asked and much interest being taken in the Hon. Mr. Bulyea's efforts to assist the farmers. From Gainsborough a 25-mile drive brought us to Melita on the evening of July 7. Here I finished my work for the North-west Government—three weeks of delightful travelling, in which a large tract of country quite new to me was traversed and in which I had enjoyed many opportunities of studying the insects and plants of the country passed through. I must here express my gratitude to the Hon. Mr. Bulyea for frequent modifications in his plans, which I know were made entirely on my account, so that I might see as much as possible of this interesting country and have every convenience to collect plants and insects, noxious and beneficial.

Manitoba.

On July 8, in accordance with an agreement with the Manitoba Government, I went to Elkhorn, Man. and addressed a meeting of the Elkhorn Farmers' Institute. I remained at this place till the following day, when I took the train back to Winnipeg to assist in the arrangement of the exhibit of the noxious weeds of Manitoba, shown in the Weed Tent of the Provincial Government of Manitoba at the summer Industrial Fair. This exhibit was an unqualified success. Almost every kind of the noxious weeds of the province was shown, plainly labelled with its English and scientific names, and at all times of the day some officials of the department were in attendance to give such information as might be desired by the thousands of farmers who visited the exhibit every day from early morning till late at night.

British Columbia.

On the morning of July 13, I left Winnipeg and proceeded westward to British Columbia by way of the Crow's Nest Pass, visiting the thriving and active towns of Nelson and Rossland on the way. I reached Vancouver on July 19, when I joined Mr. J. R. Anderson, the Deputy Minister of Agriculture for British Columbia. The afternoon was spent in admiring the colossal trees and other plants in Stanley Park. On the morning of the 20th New Westminster was visited, and we reached Victoria the same evening. The 21st was spent in the Department of Agriculture, examining the collections and answering correspondence forwarded from Ottawa. In the evening we went out by special train to South Saanich, where a largely attended meeting of the Victoria Farmers' Institute was held ; the subjects treated of at this meeting were weeds of the farm and injurious insects. We returned to Victoria the same night, and on the morning of July 22 left for Duncan's, on the Esquimalt and Nanaimo Railway. We were met at the station by Mr. G. H. Hadwen and driven out to his fruit farm. We returned to Duncan's for a meeting of the Farmers' Institute held in the afternoon. The subject of main interest at this meeting was Hay and Pasture Grasses. Noxious Weeds and Agricultural Education were also discussed at some length. After the meeting a visit was paid to the grounds of Mr. W. C. Duncan to examine a patch, which he had had under cultivation for many years, of *Bromus virens*, Buckl. (*B. Hookerianus*, Thurb.), a grass of much promise closely resembling the Southern Brome grass (*Bromus Schraderi*, Kunth). We returned by the evening train to Langford and drove to a meeting of the Metchosin Farmers' Institute. This meeting had been well advertised and was largely attended. After the meeting we drove back to Victoria reaching there at 1.30 a.m.

On Monday morning, July 24, in company with Mr. Anderson, I started for the interior of Vancouver Island ; we arrived at Nanaimo about noon and were joined by the Rev. G. W. Taylor, of that place. After lunch we drove 36 miles to Mr. R. F. Hickey's, at French Creek, and later in the evening back to McCarter's Hotel, where an evening meeting was held. This day's journey was full of interest on account of the wonderful forests with which this part of the island is clothed. Objects of great wonder were the enormous trees of *Arbutus Menziesii*, Pursh, many of them over 2 feet in diameter and some large specimens reaching even 3 feet. The next morning we started at 6 o'clock and drove 30 miles to Alberni, arriving there at 3 o'clock in the afternoon.

The drive past Cameron Lake and around the foot of Mount Arrowsmith is one of the most remarkable drives I have ever taken—the road magnificent, smooth and well gravelled the whole way, and through a most wonderful forest, a tract of two miles just past Cameron Lake on the Alberni side, particularly shows the Vancouver Island forests in perfection : gigantic Douglas Spruces, Hemlocks and Cedars—specimens of these trees from 6 to 8 feet in diameter being found by thousands—growing so close together, only 30 or 40 feet apart, that the straight trunks rise up over 100 feet before a branch is reached. The heads of these giants seem very small compared with their towering trunks. The undergrowth beneath these trees is remarkably sparse and consist almost entirely of mosses and ferns, with the beautiful and fragrant *Achlys triphylla*,

DC. The woods the whole way are characteristically mountain woods. The Salmon Berry (*Rubus spectabilis*, Pursh) with its luscious fruit, like enormous orange or maroon-coloured raspberries, was in full fruit, also the Red-berried Vaccinium (*V. parvifolium*, Smith), a most beautiful shrub with bright red fruit like yew-berries, borne singly and produced in such quantities as to bend down the slender branches. A noticeable feature along the road was that many introduced grasses and weeds were abundant which had been brought in either by the road-makers or in carrying hay over the road.

A meeting was held at Alberni in the evening and the following morning we started at 4.30 and drove back 30 miles to Little Qualicum, where we caught the steamer *Thistle* and went to Comox, reaching there at five o'clock in the afternoon. Thence we proceeded at once to Courtney, where we passed the night. The next morning an interesting drive was taken to the mining town of Union and to a beautiful lake three miles beyond. The heat was excessive, but a good meeting was held in the evening, the addresses being followed by animated discussions, the so-called Canada Thistle being the principal subject.

On the morning of July 28 we left by the 7.30 steamboat and reached Nanaimo at five o'clock in the afternoon and started at once with the Rev. G. W. Taylor for Cedars, where a small but enthusiastic meeting was held in the evening. We then returned to Nanaimo for the night. A meeting was to have been held at Salt Spring Island on Saturday the 29th, but we found that the steamboat had been taken off for some excursion, and it was impossible for us to reach the island. We therefore returned to Victoria and remained there until Sunday night, when we took the eleven o'clock steamboat for the mainland. Vancouver was reached by eight o'clock and New Westminster at eleven; we then took the steamer for Ladner's Landing, where our first meeting on the mainland had been advertised. Leaving Ladner's at five o'clock the next morning, we drove back and took the steamer opposite New Westminster for Langley. A good meeting was held in the afternoon, after which we proceeded by canoe to Port Haney and from that place walked to Hammond, where we passed the night. The next morning we took train for Abbotsford, where an informal meeting of farmers was held. In the evening we returned to Mission Junction, and the meeting at night was one of the best of this series, being well attended and much interest shown in the subjects discussed. On the morning of August 3, I walked to Hatzic with Mr. Tom Wilson, a member of the Provincial Board of Horticulture, and examined several fine orchards, many of which, however, were seriously injured by the attacks of the Pear Slug, against the injuries of which no steps seemed to have been taken. From Hatzic we proceeded by steamer to Chilliwack, where a most successful meeeting took place. Chilliwack is one of the most favoured spots in British Columbia and the meetings, being always well worked up, are invariably satisfactory. On the afternoon of the 3rd we drove out to inspect a currant plantation belonging to Mr. Ford, which was heavily infested by a downy scale insect, *Pulvinaria occidentalis*, Ckll, the western representative form of the well-known eastern Cottony Maple Scale, *Pulvinaria innumerabilis*, Rathvon. Leaving Chilliwack on the morning of the 4th, we reached Agassiz before noon. The afternoon was spent in examining critically the pastures of the Experimental Farm with a view to discover if possible any plants which might be the cause of the disease among cattle known as 'Red Water.' Nothing of importance was discovered, and none of the plants reputed to be the causes of this obscure disease were found in undue abundance, nor could it be seen that any of those which did occur had been eaten by stock which had fed there. A very successful meeting of the Farmers' Institute was held in the evening. This was well attended and was followed by a protracted discussion. In addition to Mr. Anderson and the writer, Mr. Thomas Sharpe delivered an address.

Starting at 4 o'clock on the morning of August 5, an expedition was made to the summit of Mount Ché-am for the purpose of collecting botanical and entomological specimens. We were accompanied by Mr. Allan Brooks, an enthusiastic ornithologist, and one guide, Jim Harris, a Ché-am Indian from Popcum, well acquainted with the mountain and an experienced climber, who was of great service to us. Notwithstanding the lateness of the season and the exceedingly unpropitious state of the weather which prevailed while we were on the mountain, we made large and valuable collections

both of plants and insects. As a result of the late season, we found on the summit banks of snow 75 and 100 feet deep, where last year at the same date we had seen deep ravines. On the morning of August 8, it began to rain at 6 o'clock, so we decided to descend at once, and at eight o'clock struck camp and began the descent of the mountain in a downpour of rain, which continued all day till we got to the base at 16 o'clock, drenched to the skin, but with all of our specimens safe, as we had wrapped them in waterproof covers before starting. At Popcum we took a hasty meal and crossed the Fraser River by 17.30 o'clock. The following morning was fully taken up attending to our specimens and in drying our clothes to be ready to leave for the upper country on the train at 15.47 o'clock.

We reached Sicamous on Shuswap Lake at 2.35 o'clock and waited there in pouring rain till 6 o'clock, when we took the Okanagan Valley train for Armstrong, arriving there at 9 o'clock. We had hoped to have collected many specimens in this locality, but it rained all day. Our time, however, was by no means wasted, for we examined a very interesting local collection of plants and insects made by Mrs. Walton, of Armstrong, and in the evening held one of the best meetings of our whole trip. This was of the Spallumcheen Farmers' Institute. Some of the worst weeds of the Northwest, including the Tumbling Mustard, False Flax and Ball Mustard, were found to have gained a foothold in this fertile valley, and the farmers were keenly interested in learning all that was to be known about them. The Prickly Lettuce (*Lactuca Scariola*, L.) and the Purslane (*Portulaca oleracea*, L.), both of gigantic dimensions worthy of the Pacific Province, were brought to the meeting. We left Armstrong at 9 o'clock on the morning of August 11, for Okanagan Landing, where we took the fine steamer *Aberdeen* for Kelowna, and reached there at 16 o'clock. After being shown over the new and up-to-date factory of the Kelowna Shipper's Union, where the now well known 'Flor de Kelowna' cigars are made, we were driven out to see the surrounding country by Mr. J. T. Davies, the President of the Okanagan Farmers' Institute. We first visited Lord Aberdeen's ranche at Guisachan, where we were shown fields of Smooth Brome grass. We then visited the extensive and successful tobacco plantations of Messrs. Collins and Holman, and finally accompanied Mr. Davies to his own home. The meeting at Kelowna was held at 20 o'clock in the evening and was, as is always the case at this bright active little town, well attended and very successful. We left this delightful place at noon on August 12 and reached Enderby at 18 o'clock the same evening ; there we left the train and drove across the country to Salmon Arm, arriving at 20.30 o'clock, just in time for the meeting of the Salmon Arm Farmers' Institute. This meeting, although not so largely attended as those at Armstrong and Kelowna, was full of interest, as this place is becoming a fruit growing centre of importance in the province. The addresses were attentively listened to and fully discussed.

This was the last of a series of sixteen useful and most enjoyable meetings held with Mr. Anderson in the best agricultural and fruit growing districts of British Columbia. Mr. Anderson's thorough knowledge, not only of the capabilities of his province, but also of its fauna and natural history, made him a most entertaining companion ; the careful arrangements he had made beforehand enabled me to take the fullest advantage of the expedition, which was of inestimable value to me in becoming acquainted with the conditions prevailing in the various localties visited, so that I might be of as much use as possible in the future to such farmers of British Columbia as may wish to correspond with the Division of Entomology and Botany.

We left Salmon Arm at 1.25 o'clock and reached Banff, Alta., by 17 o'clock on August 13. I remained there until the next day, when in company with Mr. W. C. McCalla of St. Catherine's and Mr. N. B. Sanson, Curator of the Government Museum at Banff, both enthusiastic botanists we sallied out, and, notwithstanding the torrents of rain which fell almost continuously, I added several desirable botanical specimens to my collections. On August 14, I left for home at 16.10 o'clock, reaching Winnipeg at 21 o'clock on the 15th, and Ottawa at 18 o'clock on August 17.

REPORT OF THE POULTRY MANAGER

(A. G. GILBERT.)

To Dr. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have pleasure in herewith inclosing to you the twelfth annual report of the Poultry Department.

The work of the year embraced certain experiments, particulars of which are given in full under their distinguishing headings. Briefly outlined they are :—

Experiment in order to ascertain the laying qualities of old hens and pullets.

The placing of three groups, of five each, of Barred and White Plymouth Rocks and Silver Laced Cockerels in pens with limited runs attached, with the object of finding the relative value as flesh formers of rations composed of whole grains, another of ground grains and a third embracing both.

Penning up cross-bred cockerels and feeding them on ordinary rations with the view of noting flesh development.

The preservation of eggs, in order to find out the best means of doing so.

Artifical incubation.

An important feature of the year was the discovery of a fatal disease among turkeys, new in Canada but not in the United States. The disease Entero-Hepatitis has no doubt been the cause of the death of many turkeys throughout the country. A description of the disease and manner of its discovery will be found in its proper place.

Addresses on subjects kindred to my department were delivered during the year at different points in the country.

The increase in volume of correspondence and demand for literature on poultry keeping, as well as the erection of numerous houses by farmers and poultry plants by private individuals and joint stock companies, denote rapid development in poultry culture for profit.

It affords me pleasure to again testify to the zeal and energy of Mr. George Deavey, to whose proper handling of the rations, so much success in the production of eggs in winter and the rapid growth of the chickens in summer is due.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, December 30, 1899.

The work of the past year differed from that of the previous years in so far that during the period of winter laying, which is one of the most important, the laying stock were divided into three sections, viz. :—

1. Old hens of three years of age and over.
2. Hens twelve months of age, known as yearling hens.
3. Pullets, always understood to be of that season's hatching.

The divisions were made for the purpose of experimental investigation into the laying merits of the hens of the different ages designated.

There has always been much speculation, but no satisfactory data, as to the egg-producing value of the older and younger stock. Each class had its votaries. There were those who contended that pullets were the best money makers, because they laid the most eggs. Again, there was the statement that while pullets might lay more eggs than the older hens, their eggs were not worth so much, because smaller in size. And a third party, whose contention is that the eggs of the two-year old hens were best to hatch chickens from, because the progeny were more likely to be strong and robust than offspring from eggs of pullets, which are immature fowls.

The claims of each party certainly embraced strong features and afforded scope for interesting investigation.

Accordingly, the fowls, on going into winter quarters during December of last year, were divided into three groups as described above.

Many of the old hens were three years of age, and some over that figure, so that good opportunity was afforded to make fair comparison.

The following table will show the results of the experiment, it being borne in mind that the object was to have eggs in winter, the season of high prices :—

TABLE showing comparative laying merits of Old Hens, Yearling Hens and Pullets.

Number.	Description.	December.	January.	February.	March.	April.	May.	June.	Total.	
	OLD HENS.									
13	White Leghorns..........	40	50	32	91	130	160	88	591	
10	Barred Plymouth Rocks...	54	63	58	109	114	91	66	555	
9	Coloured Dorkings........	76	46	65	48	51	26	30	342	
7	Black Minorcas...........	49	40	47	84	96	120	57	493	
39									1,981	
	HENS, ONE YEAR OLD.									
11	White Leghorns..........	83	38	83	106	131	115	55	611	
11	Barred Plymouth Rocks...	72	49	72	135	111	83	36	558	
22									1,169	
	PULLETS.									
8	White Leghorns...	41	106	90	84	98	119	67	605	Hatched June 11.
8	White Plymouth Rocks...	23	106	101	117	105	74	34	560	" Apl. 25 and May 9.
8	Barred " " ...	91	119	88	131	116	103	52	700	" Apl. 30 and May 24.
8	Langshans................	4	35	42	55	62	100	31	329	" May and early June.
8	Black Minorcas.....	25	39	102	77	91	94	24	452	" May 9 and May 26.
8	Brown Leghorns..........	18	81	77	104	87	114	47	528	" May 17.
48									3,174	

The fowls were kept under the same conditions, with the exception of food, of which the pullets received a greater quantity for reasons given further on.

Some of the points shown by the table, are :—

1. The pullets laid more eggs than either old or yearling hens, except in the case of seven old Black Minorca hens.

2. The eggs of the older hens were larger and in consequence worth more. Mr. Walter Paul, family grocer, of St. Catherine Street, Montreal, says in a letter, 'we pay more for the new laid eggs of large size.'

3. The laying of more eggs by seven Black Minorca old hens, than by eight pullets of the same breed, goes to show that the contention that the hens of the Mediterranean classes are good layers up to three years of age inclusive, is warranted in this case.

4. If eggs were sold by weight, the larger eggs of the older hens would be most in demand.

5. The late May and middle of June hatched Langshan pullets, did not lay half as many eggs as the same number of earlier hatched Barred Plymouth Rock pullets. There can be but one deduction and that is to have the pullets of the Asiatic and American breeds hatched as early as possible.

WEIGHT OF HENS AND PULLETS EGGS.

The weight of eggs of different breeds is given as follows :—

		Lbs.	Oz.
Barred Plymouth Rock hens, one dozen		1	11
" " pullets	"	1	6
White Leghorn hens	"	1	10
" pullets	"	1	6
Brown Leghorn hens	"	1	9
" pullets	"	1	4
Light Brahma hens	"	1	11
" pullets		–	—
Black Minorca hens	"	1	11
" pullets	"	1	7
Andalusian hens	"	1	11
" pullets	"	–	—
S. L. Wyandotte hens	"	1	9
" pullets	"	1	6

HOW TO HAVE EARLY HATCHED PULLETS.

Early hatched pullets may be secured in two ways, viz.:—

1. By using hens to hatch them.
2. By incubators and brooders, or brooding house.

The first method is more likely to be practised by the great majority of farmers, for the time being at any rate. But there are certain conditions in connection with hen-hatched chickens that the farmers must be acquainted with or desired results cannot be obtained. It must be borne in mind that in order to have early sitters, the hens of the sitting breeds should lay in winter. If they do not, as is too frequently the case, they will not become broody until they have laid their quota of eggs in spring, and this, with the further period of three weeks required for the hatching of the young birds, may mean the end of May or the beginning of June before the first chickens make their appearance. Past experience in our poultry department has shown that when Plymouth Rocks, Wyandotte or other hens of the sitting varieties lay, all winter, there are broody hens enough in March or early April to hatch out many chickens by first week in May ; and early May chickens, with proper care and food, have been found to grow rapidly. The weather is always a factor. Some seasons are milder and earlier than others. Early May hatched pullets, of the American breeds, should lay in late October, or early in November. In 1897, one of three Barred Plymouth Rock pullets hatched in our poultry department on March 11, laid her first eggs on September 20 following, (five months and nine days), and the others shortly afterwards. A year or two previous a Barred Plymouth Rock pullet hatched April 29, laid her first egg four months and

twenty-nine days later. She was the earliest pullet to lay in the history of the department. Early May hen hatched chickens, seem to grow best and give the most satisfactory results as flesh formers and layers. Earlier in the season the weather is too cold to permit a rapid growth, unless mother and brood are placed in a warm compartment, and the floor covered with earth. Or when the chicks have been taken away from the mother hen and placed in a properly constructed brooder, or brooding house. In the colder portions of the Dominion where ordinary facilities are at the disposal of the farmers, hen-hatched chickens of early May will be found to give the best satisfaction.

THE SECOND METHOD OF RAISING EARLY PULLETS.

But it may be said—indeed is often said by correspondents—that pullets are wanted to lay four or six weeks earlier than those which are hen hatched, or at the time when the older hens are in moult and eggs scarce and high in price. In such a case recourse must be had to the second method, viz.:—

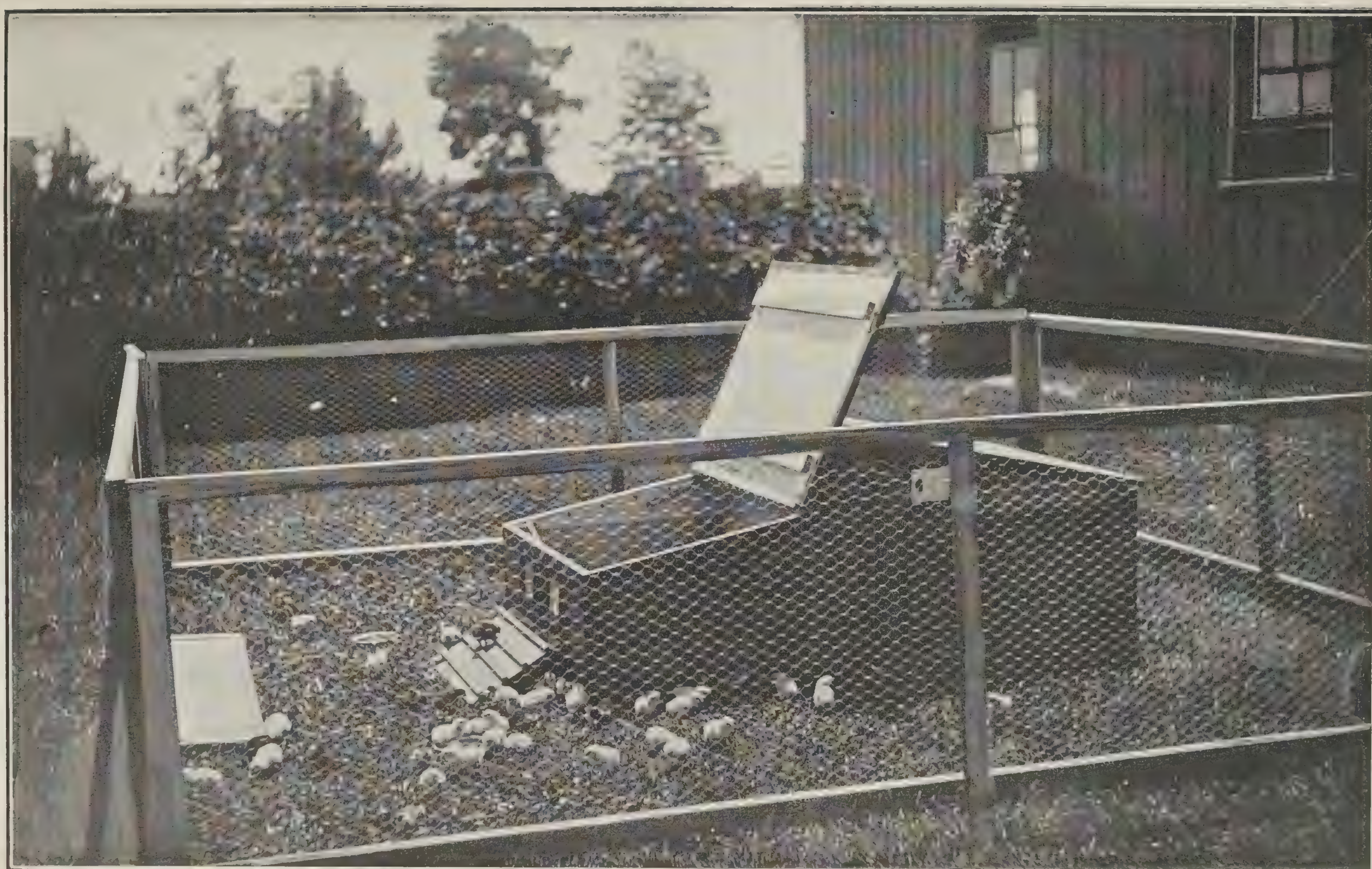
By incubators and brooders, or brooding houses. The early hatching and rearing of chickens by artificial means is becoming more in vogue because incubators and brooders have become more easy in operation and certain in results. It is certainly the only way by which one party, or a company of capitalists can hatch out a large number of chickens during the winter months or early in spring. If only a limited number of eggs are required for incubator use in late winter or early spring and the hens are also stimulated to lay eggs for sale in December and January and part of February, skill and experience are required in the handling of the laying stock, so as have a large percentage of the early eggs fertilized. In certain cases it may be advisable to keep a number of hens to lay eggs for incubator use only. Where chickens are wanted in comparatively small numbers a good brooder, or sectional brooder house, may be found sufficient, wherein to care for the chicks, until the weather permits of their being put in coops outside. But in large establishments where the artificial hatching and rearing of chicks for sale as early broilers is conducted on a large scale, an extensive brooding house is required. In such establishments a great number of hens are kept mated and managed so as to lay as large a percentage of fertile eggs as possible. Hatching by incubators begins in December or early January and the chickens do not leave the brooding house until put on the market, ten or twelve weeks later. Few eggs are sold for eating purposes, the aim of the management being to convert the dozen eggs, which for eating purposes are worth at city prices 35 or 40 cents, into broilers or early roasters worth at the proper season $1.25 to $1.50 per pair. A dozen eggs from which are hatched six or eight chickens, after making allowance for cost of rearing, affords at the figures mentioned a large margin of profit to the skilled and experienced managers. Speaking on the subject, Mr. A. F. Hunter, the well known proprietor of Cleft Rock Poultry Farm, South Natick, Mass., said 'while some persons are content to so manage their hens as to make only 40 cents per dozen on the city markets for their winter eggs, others by their skill in management and expert knowledge of artificial incubation make the dozen eggs worth to them four to five dollars. The margin of profit is there. It is only a matter of skill and perseverance to make it.'

There are several farmers in Canada who successfully use incubators and who are on the way to be specialists. They are found in the neighbourhood of the larger towns and cities. But the great majority of our farmers have yet to learn how to have their hens lay in winter and their energies meanwhile should be directed to

1. So managing their hens as to have eggs in winter.
2. And so have, not only a high price for their eggs, but early sitters to hatch out early chicks for market and pullets for early layers.

HOW THE OLDER HENS WERE FED.

Previous experience had shown that the same quantity of food given to the pullets with good results when fed to older hens made them too fat. Accordingly the older



Brooder in inclosure in Poultry Department, Ottawa, with Chickens Hatched with Incubator.

hens were fed rations, in such quantities, as past experimental work had shown was best for egg results and health of stock, viz :—

MASH, composed of ground grains, with ground clover, or vegetables mixed into it, in proportion of one quart to every fifteen hens. Fed three times per week, in morning and sometimes in afternoon.

CUT GREEN BONE, one pound to every fifteen or sixteen hens three times per week, or, at such times as the mash was not given.

WHOLE GRAIN, principally wheat. Fed for afternoon last ration, in quantity about 5 to 7 pounds to every 100 hens.

After morning ration, oats, sometimes millet seed, in small quantity were scattered in the litter on the floor of the pens to incite to exercise.

At 11 a.m. lawn clippings steamed were given. Vegetables, principally mangels, were before the layers all the time. Mica grit, crushed oyster shells and pure water were in constant supply. While cabbages were to be had they formed part of the green food.

HOW THE PULLETS WERE FED.

The pullets were fed more than the older hens. A little mash and a small quantity of cut bone were fed every day, but at different times.

Whole grain composed the afternoon ration.

The feeding of mash, cut green bone and whole grain actually represented three rations per diem.

As with the older hens, steamed lawn clippings, vegetables and the other essentials mentioned were regularly furnished.

Careful watch was kept on the birds in order to detect the slightest effect of this stimulating ration on their condition. At the end of January the Barred Plymouth Rock pullets showed symptoms of being overfat. Accordingly the rations of all the pullets were reduced to the same number and quantity as fed to the other hens. Meanwhile the output of eggs was most satisfactory, as the following table will show. It will be noticed that on several days, during mid-winter, that six eggs were obtained from a pen of eight pullets and more frequently five and four eggs, which is remarkably good laying. Particulars will be learned from the following :—

STATEMENT showing eggs laid per day by Pullets during December, January, February and March.

—	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
8 White Leghorns:—																																
December	..	..	..	..	..	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	3	3	4	2	3	4	41
January	2	3	4	3	5	1	7	5	2	4	5	2	3	2	5	1	4	4	3	3	4	3	3	3	3	5	3	4	4	3	3	106
February	3	4	2	5	1	3	5	2	4	4	2	6	2	3	4	3	2	6	1	3	3	3	3	4	3	4	2	3	....	....	....	90
March	3	2	3	3	5	3	4	2	2	3	3	4	3	4	1	1	2	2	2	3	4	2	3	3	2	4	2	2	2	2	3	84
																																321
8 Black Minorcas:—																																
December	..	..	..	..	1	..	1	..	..	1	1	1	....	1	....	1	....	1	1	1	1	1	....	1	1	1	1	1	2	3	3	25
January	2	1	..	1	2	1	3	2	1	....	1	1	1	1	1	....	2	1	1	2	2	1	3	1	1	1	1	1	1	2	1	39
February	2	2	1	3	4	2	4	5	4	5	5	3	5	4	3	4	1	5	4	4	6	3	5	4	4	3	4	4	....	....	....	103
March	3	4	3	5	1	4	2	3	1	4	4	2	3	2	4	2	3	2	2	4	2	3	2	4	2	3	2	1	1	1	3	82
																																249
8 Langshans:—																																
December	..	..	..	..	..	..	..	..	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	2	4
January	1	2	1	3	1	3	1	1	..	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	....	1	1	1	2	1	35
February	1	2	..	..	1	1	3	..	2	2	1	3	2	1	2	2	2	2	1	2	1	1	1	2	1	1	4	1	....	....	....	42
March	1	2	1	2	3	2	2	1	2	2	2	2	2	2	2	3	2	2	2	2	1	1	1	2	2	1	1	3	1	2	2	56
																																137
8 Barred P. Rocks:—																																
December	..	..	1	1	1	1	..	2	3	2	2	5	2	4	5	4	5	4	3	3	4	4	4	4	4	4	3	4	5	4	3	91
January	4	3	5	4	4	4	3	5	3	5	4	4	3	2	3	4	3	4	3	4	5	3	4	5	6	2	6	3	4	3	4	119
February	3	4	3	3	3	3	2	5	2	3	2	4	2	3	4	4	3	4	3	4	2	1	2	3	3	4	5	4	....	....	....	88
March	5	4	5	4	5	5	3	5	4	5	4	4	5	4	3	4	3	5	3	4	5	4	4	4	4	4	5	4	5	3	4	130
																																428
8 White P. Rocks:—																																
December	..	..	..	..	..	..	..	..	..	....	....	....	....	....	....	....	1	1	1	1	1	1	1	1	1	3	1	2	2	3	3	23
January	1	3	3	2	4	3	2	3	4	5	4	3	4	2	4	4	2	3	3	4	3	4	6	3	5	4	5	4	4	3	4	108
February	6	3	5	4	2	3	6	4	5	4	3	4	3	4	4	2	4	2	4	3	3	3	2	3	3	3	5	4	....	....	....	101
March	4	4	4	4	5	4	3	4	4	4	3	4	4	3	4	4	3	4	3	4	4	4	4	4	4	4	4	4	3	3	3	117
																																349

8 Brown Leghorns :—																																
December	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	1	1	2	2	2	1	2	2	2	18
January	1	2	2	2	2	2	2	2	2	4	1	2	3	4	1	2	3	3	4	2	2	5	2	3	4	3	3	4	3	3	3	81
February	4	2	3	2	1	4	2	4	3	1	5	1	5	1	1	5	2	3	2	2	1	3	5	2	4	3	3	3	...	...	...	77
March	5	1	5	4	4	3	2	4	4	5	6	4	4	4	3	2	5	2	4	3	5	2	3	3	4	2	2	4	2	1	2	104
																																280

EXPERIMENT 2.—FATTENING OF PLYMOUTH ROCK AND WYANDOTTE COCKERELS ON WHOLE AND GROUND GRAIN, THE BIRDS HAVING LIMITED RUN.

On the 15th of August, 1899, three groups of five birds, in each group, of thoroughbred Barred and White Plymouth Rocks, and Silver Laced Wyandottes, were placed in separate pens with limited outside run. The birds wore legbands with distinguishing numbers.

Each group was fed on rations of different sorts.

No. 1 Group of five Barred Plymouth Rocks was fed solely three times per day, on whole grain consisting of two parts of wheat, one part barley, one part corn.

No. 2 Group of five White Plymouth Rock Cockerels were fed three rations per diem, on grains of same kind and in same proportions as fed to No. 1 group, but ground and mixed into mash.

No. 3 Group.—Five Silver Laced Wyandottes were fed the rations usually given to the growing chickens, viz., mash twice and whole grain once per day.

The amount of food given to each group of five birds per day was 12 oz., or 4 oz. three times per day, viz., morning, noon and afternoon. The value of the ¾ lb. ration per day was placed at 1 cent per day per group of five birds, or 3 cents per day for three groups of fifteen birds.

It had been observed after feeding several rations that no more food was consumed than the quantities named. It was consequently resolved not to increase the amount but to note the effect of these apparently limited quantities. The cost of food per day of 1 cent for the five birds is corroborated by the experiment with fifty hens, particulars of which are given in 1897 report, and in which it is shown that fifty hens were kept in winter at 10 cents per day and gave satisfactory results in eggs.

The following statement shows the weight development per bird per week :—

TABLE showing gain made by three groups of thoroughbred cockerels fed on whole grain, ground grain and a mixed ration respectively.

Description of Birds.	Weight on going into pens; Aug. 15, '99.		Weight at end of first week.		Weight second week.		Weight third week.		Weight fourth week.		Weight fifth week.		Weight sixth week.		Weight seventh week.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
5.—B. P. Rocks.																
No. 41	2	14½	3	½	3	2½	3	4¾	3	8	3	12½	4	3½	4	6
" 59	2	8¼	2	9	2	9¾	2	11¼	2	13½	3	¾	3	8¾	3	11
" 35	3	½	3	1¾	3	3¾	3	6¼	3	9	3	15¼	4	7¼	4	10¾
" 70	2	7¼	2	8¾	2	11¾	2	13¾	3	½	3	6½	3	13¼	3	14½
" 77	2	2	2	4½	2	6¾	2	8½	2	11½	2	15	3	4	3	5
5.—W. P. Rocks.																
No. 39	2	2¼	2	6	2	9¾	2	13	3	2	3	8¼	4	¼	4	2¾
" 31	2	½	2	7¼	2	10¾	2	13¼	3	2½	3	9½	4	3½	4	9
" 60	1	3¾	2	10	2	12¾	3	1¾	3	4	3	8¼	3	15½	4	3
" 51	2	1½	2	8¼	2	13¾	3	1½	3	6	3	15	4	8¾	4	12¾
" 43	1	14½	2	4¼	2	7½	2	10¾	2	15¾	3	5¾	3	14¼	4	1¾
5.—S. L. Wyandottes.																
No. 36	2	9½	2	14¼	3	¾	3	4¼	3	8½	3	15	4	6	4	7½
" 33	2	7¾	2	13½	2	14	3	1¼	3	3½	3	11¼	4	1	4	4
" 83	1	13½	2	1¾	2	3¼	2	5	2	8½	2	9½	2	11	2	14½
" 79	1	9½	1	14¾	2	1	2	3¼	2	6¼	2	9	2	15¼	3	½
" 11	1	8¼	1	13¾	1	15	2	1	2	4½	2	5½	2	10¾	3	¼

Description of Birds.	Weight eighth week.		Weight ninth week.		Weight tenth week.		Weight eleventh week.		Weight twelfth week.		Weight thirteenth week.		Weight fourteenth week.		Total gain in fourteen weeks.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
5.—B. P. Rocks.																
No. 41	4	12¾	4	14½	5	5	5	8	6	¼	6	..	6	12½	3	14
" 59	3	11¼	3	14¾	4	1¼	4	4¼	4	15¾	5	3	5	13¾	3	5½
" 35	5	1¾	5	5	5	11¼	5	15¼	6	6¼	6	12	7	1½	4	1
" 70	4	1¾	4	5¾	4	11	4	12	5	6	5	12	6	4¾	3	13½
" 77	3	9¾	3	12¾	3	15	4	4	4	15½	5	9	5	12¾	3	10¾
															18	12¾
5.—W. P. Rocks.																
No. 39	4	8	4	11	5	..	5	1	5	10¼	5	13	5	13¼	3	11
" 31	4	12¼	4	15½	5	1¼	5	7½	5	12½	6	4	6	7	4	6½
" 60	4	8¾	4	12½	4	12¾	4	12¾	4	14½	4	14½	4	10¼	3	6½
" 51	5	4	5	6½	5	8½	5	9½	5	15	6	4	6	10¼	4	8¾
" 43	4	8¾	4	11¾	4	15	5	4¼	5	9½	5	11	6	1	4	2½
															20	3¼
5.—S. L. Wyandottes.																
No. 36	4	10½	4	11½	4	15¾	5	2½	5	8¾	5	15½	6	..	3	6½
" 33	4	6¾	4	9	4	13	4	13¼	5	5½	5	9	5	14¾	3	7
" 83	3	4½	3	8	3	10¾	3	11¼	4	2¼	4	5	4	11¼	2	13¾
" 79	3	4¾	3	7¼	3	10¾	3	12½	4	..	4	4½	4	9	2	15½
" 11	3	7	3	7¾	3	11¾	3	14½	4	4½	4	9½	4	11¾	3	3½
															15	14¼

* At the end of the tenth week the birds were allowed an unlimited run in a large field, and made in the majority of cases better progress than they did in the limited run.

EXPERIMENT 3—PROGRESS IN WEIGHT DEVELOPMENT MADE BY CROSS-BRED COCKERELS ON ORDINARY RATIONS.

On November 7 last, twelve cross-bred cockerels, as described further on, were put into small coops, each coop containing a single bird. The coops had a feeding trough in front of them, and were the same as used in the fattening of thoroughbreds experiment of the previous year.

The birds were fed on the ordinary mash giving to the laying stock.

The object of the experiment was to ascertain the weight development of these first crosses without any specially prepared food or special effort beyond cooping them up and feeding them three times per day.

The following are the crosses composing the dozen birds :—

Nos. 1 to 9—Cockerels of White P. Rock-white Leghorn cross.
No. 10—Cockerels of Light Brahma, P. Rock "
No. 11—Cockerels of White Wyandotte-Brahma "
No. 12—Cockerels of Andalusian "

The gain per week made by each bird is shown in the following table :—

Flesh Development of 12 Cross-bred Cockerels on Ordinary Rations.

Number	Description.	Weight on going into Coop, 7th Nov., 1899.		Weight 1st Week.		Weight 2nd Week.		Weight 3rd Week.		Weight 4th Week.		Total Gain in 4 Weeks.		When Hatched.
		Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
1	W. P. R.—W. Leg Cross..........	3	11½	3	12¼	4	¾	4	5	4	9¼	..	13¾	July 1, 1899.
2	" " "	3	3¾	3	7¼	3	10¾	3	14	4	½	..	12¾	"
3	" " "	3	4¾	3	12	4	2¼	4	5¾	4	9¼	1	4½	"
4	" " "	4	7½	4	11¼	5	½	5	3	5	5½	..	14	"
5	" " "	3	15¼	3	10¾	3	12	4	2	4	13½	..	14¼	"
6	" " "	3	6½	3	10½	3	13¼	4	3¼	4	7½	1	1	"
7	" " "	3	13¼	4	1¼	4	8¾	4	14	5	4¾	1	7½	"
8	" " "	2	15¼	3	¾	3	7¼	3	10½	4	½	1	1¼	"
9	" " "	4	5¾	4	9½	5	..	5	2¼	5	5	..	15¼	"
10	L. Brahma—P. R. Cross..........	4	6¼	5	1¼	5	10¼	5	15¼	6	6¾	2	½	June 2, 1899.
11	W. Wy.—L. Brahma "	4	2¼	4	3½	4	11½	5	1½	5	7¼	1	5	"
12	Andalusian Cockerel "	4	2¼	4	1¾	4	10½	4	14¾	4	15¾	..	13½	"

The progress made both before and after being put in fattening coop was very satisfactory. The highest weight development was made by Nos. 4, 7 and 9 of the Plymouth Rock-Leghorn first crosses. At end of 5 months and seven days these birds showed weight respectively of 5 lbs. 5½ oz. ; 5 lbs. 4¾ oz. and 5 lbs. 5 oz., or a weight per pair of 10 lbs. 10¼ oz. A weight much greater than that of the ordinary market fowls.

The weight development of the Light Brahma-Plymouth Rock cross of 6 lbs. 6¾ oz. in six months and 5 days, is also satisfactory, and goes to show that with equal care and feeding the incubator hatched and brooder reared chickens do as well as the chicks hatched by hens.

But the experience of past years leads to the conclusion that while certain first crosses may do nearly as well as thoroughbred Plymouth Rocks, that it is better for farmers to make choice of thoroughbred fowls, in the first place, and keep no other kind. A first cross would necessitate the keeping of two breeds and unless made every year would quickly degenerate into nondescripts.

FARMERS AND THOROUGHBREDS.

Some time ago Mr. A. McPhadden, a farmer of Dominionville, Ont., was advised, in reply to a letter from him, to pen up a certain number of Barred Plymouth Rock cockerels and feed them on ground grains.

He did so, and recently wrote: 'I started two weeks ago (October 25) to fatten eight B. P. R. cockerels, as advised by you. I had not a suitable place, so I put them in crates. I fed the first week as directed, three parts oatmeal and one of pease. The second week cornmeal was added. The third week the cornmeal was increased. The result was:

Total gain first week, 7 lbs. or $\frac{7}{8}$ lb. per chick.
" second week, 4 lbs. or $\frac{1}{2}$ lb. per chick.
" third week, $2\frac{2}{3}$ lbs. or $\frac{1}{3}$ lb. per chick.

The cost of producing 1 lb. of flesh was $5\frac{2}{5}$ cents per lb. I am satisfied with my experience in fattening thoroughbreds, and would not keep any other fowls now but thoroughbred Barred Plymouth Rocks.'

Subsequently Mr. McPhadden sent a number of his fattened chickens for sale to certain customers in the city. The weights of some of the cockerels were as follows:—6 lbs. $14\frac{3}{4}$ oz.; 6 $5\frac{1}{4}$; 6 $2\frac{3}{4}$; 6 $13\frac{1}{2}$; 6 $11\frac{1}{2}$; 5 14; 5 $13\frac{1}{4}$; 5 9. The birds sold at 10 cents per lb., plucked, but not drawn. They were certainly of a very superior quality.

Another well known farmer in the neighbourhood of Guelph, Ont., Mr. Laidlaw writes under date of October 17: 'I have raised a large number of barred and buff Plymouth Rocks and Silver Laced Wyandottes. They weigh at present without any special fattening $4\frac{1}{2}$, $5\frac{1}{2}$, 7 and 8 lbs. each, the latter being a few early ones.'

On October 28, Mr. Laidlaw wrote to say that 'the average weight of all my Plymouth Rock and Wyandotte cockerels was $5\frac{1}{2}$ lbs. each. Had they been penned up and specially fattened doubtless they would have weighed more. I have sold all my chickens to a buyer for shipment to the west, at much better profit than I could have made on the local market. Next season, all being well, I will get the names of the Montreal poultry dealers from you.'

It is satisfactory to note, in the latter case, to what weight the thoroughbred chickens attained, because cared for and fed properly from time of hatching. Before the first named farmer, Mr. McPhadden, had put his Plymouth Rock chickens into the fattening crates, they had made rapid flesh development, because they had also been carefully looked after and fed from time of hatching. It is well for the farmers of the country to bear in mind what has been said in previous reports, that a chicken neglected in the first five weeks of its existence seldom or never makes a satisfactory market chicken, or early layer.

The experiences of Messrs. McPhadden and Laidlaw are given to encourage those who have begun to breed the superior quality of poultry flesh, and to incite those who have not yet done so to make a beginning.

BREEDING PENS MADE UP.

On the 3rd of January the following breeding pens were made up:—

Breeds.	Cocks.	Cockerels.	Hens.	Pullets.
Coloured Dorkings	1	....	6	....
Langshans	1	....	....	12
Light Brahmas	1	....	4	3
Andalusians	1	....	7	3
Brown Leghorns	1	....	....	12
On March 1, following were mated up for producing crosses:—				
Leghorn Hens ....3, Coloured Dorking Hens 2 } B.P.R. Cockerel	....	....	....	....
On March 21, were mated Silver Laced Wyandottes	....	1	7	....

Male birds were with the Barred Rock, White Leghorn and Black Minorca hens all winter.

In several instances the early spring eggs were not as fertile as could have been desired. This may have been due to any of the following causes :—

Eggs from hens which had laid all winter.

Eggs from hens which had become overfat.

The effect of the long period of artifical life and treatment, in limited quarters, on the layers.

The subject has been already discussed at length in a previous chapter on how to secure early pullets. It is one of great importance, and is being made a matter of experimental investigation. Much seemingly depends upon any or all of the following :—

1. Kind, vitality and age of the laying stock.
2. Construction of building and temperature of same.
3. Composition of rations and quantities in which which they fed.
4. Condition of male and female breeding stock at time of mating.

DEMAND FOR EGGS FOR HATCHING NOT SO GREAT.

Eggs for hatching purposes were not in such demand last spring as in former years. This may have been partly owing to the greater number of farmers who sold eggs from their thoroughbred stock to other farmers. And it is a matter of congratulation that such is becoming the practice. The farmers of the country cannot over-estimate the value of thoroughbred stock to them for egg laying or flesh forming, as compared with the nondescript that is seldom good for either.

The following are the results from the eggs set under hens at the dates given. In some instances poor hatching was due to erratic and clumsy sitters, or to thin shells of the early eggs. In two instances eggs coming from a distance showed rough handling en route. In most instances the eggs were tested on the sixth or seventh day of incubation and their condition at the time is noted.

EGGS SET AND CHICKENS HATCHED UNDER HENS.

When Set.	Description of Eggs.	When Hatched.	No. of Chicks.
April 11..	13 B. P. Rock (partly thin eggs. Partly sitter)...........................	May 2...	2
" 22..	13 " " "	" 13...	5
" 22..	13 Brown Leghorn (from Rigaud, Que.)...........................	" 13...	1
" 22..	7 Barred Plymouth Rock, 6 White Plymouth Rock (chicks died in shell).	" 13...	4
" 22..	11 Silver Wyandottes, 2 White Wyandottes (8 eggs not fertile).......	" 13...	4
May 1..	13 White Leghorn (1 egg broken, 2 unfertile)	" 22...	10
" 1..	13 White Minorca (1 egg unfertile)...........................	" 22...	12
" 1..	13 Langshan (5 eggs tested out, 4 doubtful)...........................	" 22...	3
" 1..	13 Black Minorca (9 pullets. 1 egg broken, 2 unfertile)...................	" 22...	9
" 1..	7 Indian Game, 6 White Wyandotte (on being tested all seemed O.K.)..	" 22...	12
" 5..	13 White Plymouth Rock (from Carleton Place, Ont.)...................	" 26...	9
" 5..	13 " " "	" 26...	11
" 5..	13 B. R. Rock (from Carleton Place, Ont.)...........................	" 26...	7
" 5..	13 " " "	" 26...	9
" 6..	6 W. Wyandotte, 6 S. L. Wyandotte...........................	" 27...	10
" 10..	13 Andalusian...........................	" 31...	3
" 10..	11 W. Wyandotte, 2 Langshan (Hen killed 8 chicks in nest).............	" 31...	5
" 15..	11 L. Brahma (from U. S.)...........................	June 5...	7
" 15..	9 W. P. Rock...........................	" 5...	4
" 15..	13 Langshan...........................	" 5...	7
" 20..	13 W. Wyandotte (from Carleton Place, Ont.)...........................	" 10...	11
" 23..	13 Langshan (stock out of condition)...........................	" 13...	3
" 23..	13 B. Leghorns (2 unfertile eggs, 1 chick crushed)...................	" 13...	10
" 23..	13 W. Minorca...........................	" 13...	6
June 1..	13 B. " (7 eggs did not hatch)...........................	" 13...	6
" 1..	13 Buff Leghorn (bad sitter)...........................	" 13...	3
" 10..	13 P. R. Leghorn cross eggs (from New Edinburgh)...................	July 1...	10
" 10..	13 " " " "	" 1...	12
" 16..	13 Buff Leghorn (from Winchester, Ont...........................	" 7..	5
	370 Eggs.		200

HOW THE CHICKENS WERE FED.

The chickens made rapid and satisfactory progress on the following food and treatment:—

First food after coming from nest, where they remained for twenty-four hours after hatching: stale bread crumbs; stale bread soaked in milk and squeezed dry.

Second day. Stale bread soaked in milk. Granulated oatmeal. Milk or water for drink.

The same for three or four days longer, when finely crushed corn was given in moderate quantities.

At the end of ten or twelve days, mash composed of shorts, cornmeal, stale bread waste, broken crackers, boiled potatoes, was given two or three times in lieu of the bread and milk.

At end of fourteen days wheat was added to the bill of fare. It was fed in small quantities at first, principally at last ration for the day.

As the chickens grew their food was made as cheaply and wholesome as possible. The waste of table and kitchen may be put to good use in this way.

The chickens were fed a little food at a time, but frequently. Care was taken to avoid overfeeding in the earlier stages of life. It is better to feed only what the chickens can pick up cleanly at a meal, rather than to leave a quantity of food to turn sour and become filthy.

When sufficiently old to run about and obtain insect life the rations were reduced to three per day.

On the above rations the farmers will find their chickens grow vigorously. It is well to remember that any extra care and attention during the earlier stages of chicken life is well repaid afterwards in early maturity and increased weight.

The tables in connection with experiments 2 and 3 to be found on preceding pages will show the weight development made by cockerels of the heavier breeds and some crosses.

WHEN THE PULLETS BEGAN TO LAY.

The pullets commenced to lay in the following order:—

Brown Leghorn pullet	hatched	June 10,	laid first egg	November 15.
White Minorca	"	May 22,	"	December 10.
B. P. Rock	"	" 26,	"	" 12.
Langshan	"	" 22,	"	" 15.
Black Minorca	"	June 21,	"	" 15.
W. Wyandotte	"	May 27,	"	" 25.

THE MOULTING SEASON.

As in previous years every effort was made to get the hens through their moult as early and as quickly as possible. In order to accomplish this the cock birds were removed from the breeding pens during the first week in July and placed in small pens, in another building, with outside runs attached. The hens were then allowed to run in small fields (in rear of the poultry buildings) where they found grass, clover and insect life. They were so allowed to run until middle of August when they were given, three times per week, a mash composed of ground grains with a small quantity of linseed meal. By the middle of October the majority of the laying stock were in new feather.

WHEN WINTER LAYING COMMENCED.

The stock went into winter quarters in good health and condition. The season was unusually open, permitting the fowls to have outside run until the second week in December. Winter laying commenced about the 12th day of December. The first hens to lay were Brown Leghorns, Minorcas and Plymouth Rocks. The greatest number of eggs during the latter half of December, were laid by Brown Leghorn hens,

and Brown and White Leghorn pullets. The following shows the daily output of eggs by the number and description of hens given :—

9 BROWN LEGHORN PULLETS.

From December 11 to 31, inclusive :—5, 2, 3, 3, 3, 2, 5, 2, 4, 4, 3, 4, 4, 3, 4, 5, 3, 4, 4, 3, 3.—73.

8 WHITE LEGHORN PULLETS.

From December 10 to 31, inclusive :—3, 1, 1, 1, 3, 1, 1, 4, 2, 2, 3, 2, 2, 4, 3, 3, 3, 2, 5, 3, 4, 3.—56.

10 BROWN LEGHORN HENS.

From December 11 to 31, inclusive :—1, 1, 1, 2, 5, 2, 6, 4, 4, 4, 3, 5, 3, 5, 2, 5, 2, 4, 2, 2, 2.—65.

EGGS LAID DURING PAST YEAR.

The stock on hand at beginning of last season was 125 hens and 80 pullets. Among the hens were 50 or 60 old ones, which were kept over for sitters and breeding stock and also to take part in the laying test of old hens *vs.* pullets, particulars of which will be found in a preceding page :—

1898–9.

December	946
January	1,336
February	1,192
March	1,857
April	2,008
May	1,796
June	1,090
July	675
August	501
September	396
October	458
November	208
	12,463

STOCK ON HAND.

During late summer the great majority of the two and three year old hens were disposed of. As they were of superior quality they will make excellent breeding stock for a year or two more. The following is the number of stock on hand on the 11th of December, 1899 :—

Breed.	Hens.	Pullets.	Cocks.	Cockerels.
Barred P. Rock	12	13	2	3
White "	7	7	....	4
White Wyandottes	10	8	2	7
Silver Laced "	5	1	....	3
Light Brahmas	....	3	1	3
Langshans	12	4	2	5
Coloured Dorkings	6	....	....	....
White Leghorns	12	8	2	1
Brown "	9	9	....	4
Buff "	1	5	....	1
White Minorcas	5	8	2	3
Black "	8	9	2	1
Andalusians	3	3	....	2
White Indian Games	1	4	1	....
Crosses	8	18	....	....
	99	100	14	37

RATIONS OF PRESENT WINTER AND HOW FED.

The following are the rations of the present winter and the quantities in which they are fed :—

TO 100 HENS, ONE YEAR OLD.

Six and one-half lbs. ground grain made into mash with boiling water. The proportions are two parts shorts ; one part ground oats, barley or rye ; one part cornmeal. Varied by having clover meal or boiled roots mixed into it. Fed morning or evening three times per week.

Cut Green Bone.—Three times per week in proportion of 1 lb. to fifteen hens. Fed morning or evening when mash is not given.

Afternoon Ration.—5 to 7 lbs. of whole wheat, as may seem necessary, and when mash or cut bone is not fed.

No noon ration is given. Mangels or other roots are before the hens all the time. If they desire more food they can find it in the roots.

Mica grit, ground oyster shells and water were in regular supply.

When mash or cut ground bone is fed in the morning, a few handsfull of oats or a handfull of millet seed are scattered in the litter on the floor to incite the hens to exercise.

At 11 a. m. on days when clover meal is not mixed in the mash, steamed lawn clippings are given in limited quantity.

NINETY-NINE PULLETS.

The same rations as above and in same quantities are given to the pullets. For the reason that last winter a little mash and a small quantity of cut bone were given to the pullets every day, but was found too fattening and stimulating. This season the rations as described above are being tried. So far results have been satisfactory, as will be seen in a preceding page, which shows the number of eggs laid in latter half of December by nine brown Leghorn pullets, ten hens of the same variety, and eight white Leghorn pullets.

DISEASES OF POULTRY.

During the past year numerous letters were received describing the symptoms of different ailments, and asking for remedies. In most cases the sickness could be traced to overfeeding—especially in the case of old hens—and consequent fatal liver disease. In other cases the symptoms pointed to colds or roup, the latter frequently following the former. Ill ventilated and overcrowded quarters were also sources of ailment.

A FATAL TURKEY DISEASE.

Many letters had been received describing the symptoms of a disease which had been fatal to many turkeys in Ontario and the Eastern Townships. About the first of November last the following inquiry by a subscriber was received from the editor of *Farming*, Toronto, with the request for an immediate answer for publication :—

To THE EDITOR OF FARMING.—Will you inquire for me through your paper how to treat sick turkeys. My turkeys are drooping. Their droppings are of a green and yellow colour at the time of their sickness, and they do not last long when they take sick.

FARMER'S DAUGHTER.

A reply was made to the effect that the symptoms pointed to liver disease, or acute dysentery, caused by eating improper substances, perhaps in the shape of decayed animal or vegetable matter, and recommending the use, in the soft food, of a good condition powder and the dropping of a small piece of alum into the drink water. The suggestion was also made that the farmer's daughter should send a turkey, which had just died, to the Bacteriologist, Ontario Agricultural College, to ascertain whether death was due to germ disease or not.

THE DISEASE LOCATED.

The farmer's daughter kindly complied with my request, and the result of her disinterested action was the discovery of a disease presumably new in Canada, and which probably, heretofore, has been the cause of death of many thousands of turkeys throughout the country.

The following letter from the bacteriologist at the Guelph Agricultural College will explain the nature of the disease :—

O. A. C., GUELPH, November 23, 1899.

DEAR MR. GILBERT.—I have this day examined a turkey received from some one in Fergus, who does not give any name. It is a case of Entero Hepatitis—described in a Washington publication entitled 'Infectious Diseases of Poultry.' This is, so far as I know, a new disease in Canada, the only account of similar cases being in the publication already mentioned. I believe it has also broken out at another farm in this neighbourhood, because I am told there are turkeys dying there with spots on their liver. I thank you for giving us an opportunity of examining the disease. I may say that my roup investigations are going on, and that I believe roup is caused by a somewhat similar organism as is the turkey disease. I shall always be pleased to examine birds.

Yours sincerely,

MALCOLM ROSS.

DESCRIPTION OF THE DISEASE.

The following extract from the full and elaborate description given by Dr. D. E. Salmon, chief of the bureau of animal industry, Washington, U.S., in the publication referred to by Prof. Ross, will be found interesting :—

'The external appearance of the turkeys affected with the disease do not seem to be constant, and this is not to be wondered at in view of the varying intensity of the changes found in the internal organs. In Rhode Island the disease is known as 'blackhead' owing to certain peculiar discolorations which take place at the height of the disease. While it might be well to retain this as a popular name we do not believe that all cases of blackhead have the specific disease herein described, nor do all turkeys affected with this disease manifest the appearances of blackhead. Among the symptoms which may be expected to appear sooner or later, diarrhœa occupies a prominent place. The disease of the cœca is responsible for this. * * * Emaciation was not constantly present in the cases dissected by me. The disease seems to attack turkeys when quite young. It seems moreover as if the disease were contracted only by the young, because in the examination of turkeys of different ages the oldest showed lesions of the oldest standing. * * * The most serious and extensive destruction of tissue was noticed in the turkeys in fall. In midsummer the disease was making most progress, that is, it was freshest and the microparasites present in great numbers. It is probable that the delicate tissues of the young are best adapted for the temporary habitat and rapid multiplication of this parasite. The primary seat of the disease are the cœca. From these the liver is invaded. Other organs are not attacked. * * The appearance of the liver in the average case of this disease is very striking * * * Twice the normal size is probably near the truth. * * * In the case of No. 2 the liver weighed 10·7 ounces. * * * The processes

of advancing disease and necrosis on death of tissue on the one hand, of repair on the other, seem to go on side by side, now one now the other, predominating. * * The blood of many of the cases was examined before the bird was killed, in order to to detect any existing blood infection. No disease of the blood was observed except in the case of No. 16. * * *

The results of the examination of turkeys made thus far indicate that the disease may follow several courses.

(1.) After a certain period of disease regenerative processes begin which tend toward a permament recovery.

(2.) The disease may proceed so rapidly from the very start that the affected turkeys die early in life.

(3.) The disease may come to a standstill, but the amount of dead tissue in the cœca and liver may be so great as to favour the entrance of bacteria which are responsible for the death of the bird late in the summer or fall.

As regards the spontaneous cure of infected birds, we may regard it as probable that only those in which the disease comes to a standstill before it has made much headway are likely to recover. In those in which much destruction of tissue has taken place complete recovery is impossible. * * *

SOME CONCLUSIONS.

Investigation so far leads to the conclusion that infection takes place early in life.

That the microparasite, discharged perhaps in an encysted stage from the sick bird, is taken up with the food and water by others and sets up disease directly.

By uninterrupted transmission the disease becomes perpetuated and diffused among neighbouring flocks.

If the theory that the disease is transmitted more or less directly from old to young should prove to be true, the remedy for such a state of affairs would appear to lie in two directions :

(1.) The disease might be allowed to go on and some remedy found which will check it and lead to a cure, or

(2.) The diseased flocks might be entirely destroyed and new birds obtained elsewhere, after a thorough cleansing and disinfection of the territory formerly occupied by the flocks.

TREATMENT.

All turkeys that droop, are unable to keep up with the movements of the flock, and even have diarrhœa may not be affected by the disease. Among 50 turkeys killed as suspicious cases none were found to have the protozoan disease. They were suffering from a variety of other affections, the causes of which, mentioned in their order of frequency were, lice, tapeworms, gapeworms, ticks, injury, and a diphtheritic disease of the cœca, not to be mistaken for the genuine protozoan disease.

The success which quinine has had in combating malaria leads to the suggestion of its use.

Disinfection of coops and other structures which have sheltered the birds and other poultry, is recommended to be carried on as for bacterial disease.

The following disinfectants are given as strong enough to kill spores of bacteria and likely to destroy the various stages of the protozoa :

1. Corrosive sublimate, 1 oz. in about 8 gallons of water. The water should be put into wooden tubs or barrels and the powered sublimate added to it. The whole should stand for 24 hours so as to permit of sublimate being entirely dissolved. Apply with spray pump, broom or mop. All dirt and manure should be removed before spraying. Being very poisonous the solution should be carefully handled and well guarded. The manure should be covered with lime.

2. Chloride of lime, 5 oz. to 1 gallon of water. To be applied in the same way.

3. Ordinary slaked lime is very useful and should be used more particularly on infected soil.

TROUBLE FROM LICE.

Lice infested fowls and poultry houses are the sources of annoyance and loss to many farmers and poultry keepers throughout the country. The following is a case in point. A few weeks ago a farmer of Kings, N.S., wrote that for two years past his hen house has been infested with a white louse or spider which it seems impossible to exterminate. The insect is very minute and is found in great numbers in every part of the house. They seem to hurt the hens, which do not lay, look pale in their combs and are light in weight. Death has occurred in some cases." A reply was made that the trouble was doubtless red mites, which when they make lodgment, swarm in cracks and crevices of the wood work of roost, platform and walls of the house. They do their work at night when they get, in great numbers, on to the flesh of the fowls and suck their life blood. Hens are weakened, become emaciated and do not lay. In some instances death follows. The remedy advised was to place the fowls in temporary quarters and then to remove all portable wood-work, old nests and contents, roost, &c., and to burn them. Then make up the following solution :

Corrosive sublimate	4 oz.
Common Salt	4 "

Dissolve in two to four quarts of water. When completely dissolved, dilute to 25 gallons.

With this solution every crevice, nook and corner of the house was to be carefully sprayed. Care was advised in the handling of the solution as it is highly poisonous. It would not only be found a sure way of getting rid of the mites but of all disease germs. A thorough whitewashing was then advised, as was also the removal of any lice that might be on the hens, before returning the hens again to their quarters.

The same remedy recommended, in a similar case but in a different part of the country was said to have been as successful as could be desired.

ARTIFICIAL INCUBATION.

In the month of April last an incubator of 220 egg capacity and a brooder were purchased from the Cyphers Incubator Co., of Wayland, N. Y. The incubator was placed in a small room at end of the main poultry building and the brooder on the grass in front of the house.

In the same room was a Prairie State incubator of 100 eggs capacity and another called the 'Best' from London, Ont., and of same capacity as second named. The latter seemed to have been injured in transit to such an extent that it could not hold the heat and it was not operated.

The first two attempts in early March and April with the Prairie State were not successful. In the latter case only eight chicks were hatched of which five survived and attained full growth. The eggs were tested at the proper time and the unfertile ones removed. Examination of the remaining eggs in both cases showed embryo chickens in different stages of advancement from 10th to 15th or 16th day, between which dates life seemed to have ceased. This was more noticeable in the second attempt.

Eggs which were under hens about same time as second experiment was going on and which did not hatch were examined and showed chicks also dead in the shells. This pointed to the eggs being at fault and showed the difficulty of having early fertile eggs from hens which had been confined to limited quarters and stimulated to lay during the winter months.

It was thought that the eggs from hens which had been kept under the same conditions during the winter months and only commenced to lay in late February, or

early March, would not only be more fertile, but that the germs would be stronger. But such did not seem the case. This was attributed to the long term of winter confinement in comparatively limited quarters and the stimulating rations.

Against the foregoing is the experience of three years ago, when a broody hen was set on February 20, on thirteen eggs, from a pen of Barred Plymouth Rock hens, which had laid well from November previous; were mated in early February and from which thirteen eggs, eleven lively chicks were hatched.

On one occasion four settings of eggs were obtained early in the season from a farmer, twenty miles from the city and put into an incubator. Results were same as noted above. Later eggs were obtained from leading breeders and put under hens. Results were very little different. Both from farmer and breeders the eggs had to come to the city by express and might have been to a certain extent injured in carriage. One of the breeders said his eggs were from hens which had laid all winter. On being tested, they were mostly all found unfertile.

The whole subject affords good ground for careful experimental investigation.

The Cyphers incubator was not put into operation until May 12, when 120 eggs of different breeds were put into it. Thirty unfertile eggs were tested and out of the remaining ninety fertile eggs, sixty chicks were hatched. Of this number five were weaklings and died. Later five others succumbed. The remainder made rapid and vigorous growth in the brooder. When too large for the brooder they were placed in coops in a field. From first to last their progress was satisfactory.

EXPERIMENTS IN THE PRESERVATION OF EGGS.

The following experiments, in the way of finding out the best egg preservative, made by Mr. F. T. Shutt, M.A., chemist to the Experimental Farms, will be found interesting and useful. Much inquiry is made from time to time as to the best means and methods of keeping eggs in good condition for longer or shorter periods. An important factor, sometimes overlooked, is the certainty that the eggs are strictly fresh at time of placing in the preservative. Mr. Shutt was kind enough to associate me with himself in the experimental work, and so allow me opportunity to note progress, from the inception of the different tests until their conclusion. The results are given by himself in the following pages :—

THE PRESERVATION OF EGGS.

(By Frank T. Shutt, M.A., F.I.C., F.C.S.)

In the autumn of 1898, we instituted a series of experiments to ascertain the relative value of certain solutions as egg preservatives. The eggs used in this investigation were quite fresh, being supplied by the Poultry Department of the Experimental Farm, Ottawa, and taken from the nest within a few hours, at most, of being laid. The liquids employed were (1) a saturated solution of lime-water, and (2) a ten per cent. solution of "water glass" (sodium silicate).

The eggs were treated during the first week of October, 1898, and tested March 2, 1899. Those eggs which were not kept throughout this term in either of the preservatives, together with the untreated eggs, were placed in a rack within a drawer in the laboratory. The eggs in the solutions were also in the laboratory, and consequently all were at a temperature of about 70 degrees F. throughout the winter. The examination consisted of noting the appearance on breaking and the colour, odour, taste, etc., after poaching.

TREATMENT AND RESULTS.

No. 1. *Untreated.*—The 'yolk' was stuck to the side of the shell and was much shrunken, having lost its globular form.

The 'white' had taken on a slightly yellow tint, which was more pronounced on boiling.

The 'air-space' was very large, occupying about $\frac{1}{3}$ of the shell, showing shrinkage from evaporation.

There were no signs of decay and the eggs might be pronounced as free from odour and apparently good.

On boiling, a faint "stale" odour and taste was developed.

No. 2. Kept under lime-water 2 days and then put in rack in drawer.

The yolk was not stuck to the shell and was more globular than in the untreated, though not so globular as that in the fresh egg.

The 'white' was similar to that in the untreated.

The 'air-space' was only about one half the size of that in the untreated, showing less shrinkage.

Apparently quite good, but developing a slight 'stale' odour and flavour on boiling.

No. 3. Kept under Lime Water Seven Days and then placed in rack.

Apparently quite good; somewhat less shrinkage, perhaps, of the yolk than in No. 2, but in all other particulars giving practically the same results.

No. 4. Kept in Lime-Water continuously throughout period of testing.

Apparently quite good, but the 'white,' as before, turning slightly yellow and a faint stale odour developing on boiling.

Yolk almost, or quite, globular. 'Air-space' no larger than in fresh egg.

No. 5. Kept in Silicate of Soda twenty four hours and then placed in rack.

Apparently quite good; the "white" had taken on a faint yellow tinge. Yolk slightly stuck to shell and shrunken; "air-space" larger than in Nos. 2 and 3.

On boiling, the 'white' became slightly yellower, and the 'stale' odour before mentioned was developed.

No. 6. Kept in Silicate of Soda three days and then placed in rack.

Apparently good, but yolk slightly stuck to shell. In all respects very similar to No. 5.

No. 7. Kept in Silicate of Soda seven days and then placed in rack.

Apparently good, but yolk stuck to shell. 'Air-space' somewhat similar to Nos. 5 and 6.

On boiling, was similar to Nos. 5 and 6, as to colour and odour. Shell did not break on boiling.

No. 8. Kept in Silicate of Soda continuously throughout testing period.

Apparently quite good and no shrinkage. 'Air-space' not larger than in fresh egg. Yolk globular.

On boiling, the "white," as before, assumed a faint yellowish tinge and the egg had a slight "stale" or musty flavour. Shell broke on boiling, but not so as to allow contents to escape.

CONCLUSIONS.

1. In no instance, either of treated or untreated eggs, were any 'bad' eggs found.

2. In all cases where the eggs were not kept covered with the preservative solution, shrinkage of the contents had taken place, as shown by the larger air-space and the less globular form of the yolk. The eggs treated for seven days and less with lime-water showed somewhat less shrinkage than those treated a similar length of time with silicate of soda.

3. From the experiments here recorded, it would appear that lime-water and "water glass" used continuously, as in Nos. 4 and 8, are equally efficacious in preventing shrinkage. They may also be said to have practically the same results as regards both external and internal appearances, flavour, etc., of the eggs preserved. Since silicate of soda is more costly and more disagreeable to use than lime-water, we could not from the present results recommend it as the better preservative.

4. The albumen or 'white' in all the preserved eggs was very faintly yellow (though not to the same degree in all eggs), the tint becoming deeper on boiling.

5. No offensive odour was to be perceived from any of the eggs when broken, but in all instances a faint but peculiar musty or stale odour and flavour developed on poaching.

6. It is probable that no preservative will prevent the loss of flavour possessed by the fresh egg, but those which wholly exclude the air. (and thus at the same time prevent shrinkage from evaporation) will be the most successful. Continuous submergence is evidently better than treatment for a few days.

It is, of course, essential that eggs to be preserved should be perfectly fresh when treated.

In order to learn the effect of keeping these eggs a still longer period, a number of those treated in October, 1898, were retained under their respective conditions, or in other words, the experiment was continued until December 28, 1899, a fourteen months test, when an examination was made with the following results :—

No. 1 Untreated :—Completely dried up ; the solid contents of the shell had a faint musty odour, but no marked decomposition was apparent to the eye.

No. 2 Kept under lime-water two days and preserved in rack in drawer. The "white' or albumen had taken a yellow tint, a partial drying up of contents was observed, the yolk in many cases adhering to the shell.

No. 3 Kept under lime-water seven days and preserved in rack in drawer. Nothing offensive about contents, but 'white' was discoloured and yolk slightly hardened. Not quite so much evaporation as in No. 2.

No. 4 Kept in lime-water continuously. 'White' somewhat discoloured. Yolk of normal shape and size and quite firm. Apparently in excellent state of preservation No marked odour. Poached well and quite sweet.

No. 5 Kept in silicate of soda twenty-four hours and then placed in rack. Contents completely dried up, but no offensive odour or appearance of decomposition.

No. 6 Kept in silicate of soda three days and then placed in rack. 'White' discoloured and more fluid than normal Yolk considerably hardened, faint alkaline smell. Of the four eggs tested, one was rotten ; the other, partly dried out.

No. 7 Kept in silicate of soda seven days and then placed in rack. Similar to No. 6.

No. 8 Kept in silicate of soda continuously. Further trials, using other fluids were commenced in June of this year. The examination of the eggs was made on December 28, with the following results :—

Common salt, 10 per cent solution.—'White' quite limpid, yolk reduced in size, hardened, turned red and globular. Contents had an unpleasant smell ; the boiled eggs tasted distinctly of salt. The eggs had materially increased in weight, owing to absorption of salt.

Lime-water and 10 per cent solution of common salt.—External appearance good. 'White' or albumen slightly discoloured. Poached egg had very fair taste with a suspicion of salt.

Saturated Lime-water.—Eggs placed in solution June 9, 1899. Excellent external appearance. No appreciable change in weight. Contents: 'white' only slightly tinted, no smell; on poaching, quite eatable, though not equal in flavour to fresh egg.

Coated with paraffin and kept in bottle.—Dipped momentarily in melted paraffin on June 26, 1899. Eggs coated thickly with mould. Albumen quite fluid. Yolk turned greenish-white; very offensive; thoroughly bad.

Glycerine 5 per cent.—Immersed continuously since June 5, 1899. Very offensive smell to both eggs and fluid. Contents of egg entirely fluid and badly decomposed.

Glycerine 10 per cent.—Immersed continuously since June 5, 1899. Contents quite fluid with very offensive smell.

Distilled water.—Immersed continuously since June 26, 1899. Floating, slimy matter in fluid and covering the eggs. Three of the four eggs under trial were bad, contents being very offensive.

Conclusions.—This further investigation strongly confirms the results obtained with the first series of experiments as regards the value of saturated lime-water as an egg preservative. As far as our experience goes, no other fluid is its equal, the eggs from this preservative being far and away superior to those kept by the other methods here stated.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS FOR THE YEAR ENDING JUNE 30, 1899.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1898-9.

Live stock	$ 861 95
Feed for stock, including veterinary services	373 82
Seed grain, seeds, trees, &c.	668 30
Implements, tools, hardware and supplies	1,114 71
Drainage and drain tiles	6 25
Manure and fertilizers	270 56
Travelling expenses	1,144 66
Exhibition expenses	356 91
Blacksmithing, harness supplies and repairs	465 08
Bee department	194 82
Salaries	1,860 00
Wages, farm work, including experimental work with grain and other farm crops; also, salaries of officers in charge	6,097 83
Wages, care of stock	2,498 75
Chemical department proportion chargeable to the Central Farm	864 73
Botanical and Entomological department proportion chargeable to the Central Farm	1,109 24
Horticultural department, including salary of officer in charge	3,745 48
Poultry department, including salary of officer in charge	1,600 44
Forestry department and care of grounds	643 56
Arboretum	564 35
Distribution of trees and tree seed	64 36
Office help, correspondence branch and messenger service	3,415 97
Printing and stationery	781 30
Seed testing and care of greenhouses	866 64
Dairy department	500 23
Museum	14 35
Contingencies, including services and expenses of L. V. Labelle delivering lectures and giving instruction on tobacco culture, $448.86; gravelling roads through farm, $532.97; cutting, drawing and packing ice, $66.95; sewers, $39.37	1,618 70
Books and newspapers	176 99
Telegrams and telephones	136 13
Steers purchased for feeding experiments	2,034 97
	34,051 08
Less—Proceeds of sale of steers purchaesd for feeding experiments	2,831 07
	$ 31,220 01

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1898-9.

Live stock	$ 40 75
Feed for stock, including veterinary services	1,551 52
Seed grain, seeds, trees, &c	142 41
Implements, tools, hardware and supplies	272 21
Drainage and drain tiles	17 00
Manure and fertilizers	249 15
Travelling expenses	333 79
Exhibition expenses	233 47
Blacksmithing, harness supplies and repairs	96 70
Salary of Superintendent, also proportion of salaries for general work, Ottawa	2,485 00
Wages, farm work, including experimental work with farm crops	2,114 87
Wages, care of stock	1,156 90
Chemical department, proportion chargeable to each branch farm	504 42
Botanical and Entomological department, proportion chargeable to each branch farm	442 75
Poultry department	87 98
Horticultural department, including salary of officer in charge	982 48
Bee supplies	28 22
Forestry department, including care of grounds	120 15
Seed grain distribution	194 06
Contingencies, including postage, $31.15; mail delivery, $32.50	103 09
Printing and stationery	11 36
Books and newspapers	42 79
Telegrams	38 37
Steers purchased for feeding experiments	1,043 64
	12,293 08
Less—Proceeds of sale of steers purchased for feeding experiments	1,392 27
	$ 10,900 81

EXPERIMENTAL FARM, BRANDON, MANITOBA—EXPENDITURE, 1898-9.

Live stock ....$	141 00
Feed for stock, including veterinary services	93 60
Seed grain, seeds, trees, &c	203 17
Implements, tools, hardware and supplies	339 86
Travelling expenses	98 70
Exhibition expenses	250 20
Blacksmithing, harness supplies and repairs	265 05
Salary of Superintendent, also proportion of salaries for general work, Ottawa	2,485 00
Wages, farm work, including experimental work, with farm crops, &c	3,125 76
Wages, care of stock	600 00
Chemical department, proportion chargeable to each branch farm ..	504 42
Botanical and Entomological department, proportion chargeable to each branch farm	442 75
Horticultural department	178 35
Forestry department, including care of grounds	297 30
Poultry department	46 40
Office help, including delivery of mail, $129	324 22
Seed grain distribution	625 15
Tree distribution	213 59
Contingencies, including postage, $113.50	171 42
Printing and stationery	64 51
Books and newspapers	26 00
Telegrams and telephones	21 41
Steers purchased for feeding experiments	330 00
	10,847 86
Less—Proceeds of sale of steers purchased for feeding experiments ..	591 03
	$ 10,256 83

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1898-9.

Live stock ....$	265 26
Feed for stock, including veterinary services	45 75
Seed grain, seeds, trees, &c	205 73
Implements, tools, hardware and supplies	417 31
Travelling expenses	108 41
Exhibition expenses	254 53
Blacksmithing, harness supplies and repairs	97 90
Salary of Superintendent, also proportion of salaries for general work, Ottawa	2,485 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,806 43
Wages, care of stock	1,180 50
Chemical department, proportion chargeable to each branch farm	504 43
Botanical and Entomological department, proportion chargeable to each branch farm	442 75
Poultry department	97 10
Forestry department, including care of grounds	183 25
Office help	533 00
Seed grain distribution	333 12
Tree distribution	163 11
Contingencies, including postage, $113.86	227 50
Printing and stationery	47 64
Telegrams	1 91
Books and newspapers	4 00
Bee supplies	15 54
	10,420 17
Less—Proceeds of sale of steers	428 16
	$ 9,992 01

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1898–9.

Live stock	$	21 05
Feed for stock, including veterinary services		1 75
Seed grain, seeds, trees, &c		136 65
Implements, tools, hardware and supplies		99 73
Manure and fertilizers		68 17
Travelling expenses		130 04
Exhibition expenses		155 94
Blacksmithing, harness supplies and repairs		48 35
Salary of Superintendent, also proportion of salaries for general work, Ottawa		2,485 00
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c		2,925 36
Wages, care of stock		391 75
Chemical department, proportion chargeable to each branch farm		504 43
Botanical and Entomological department, proportion chargeable to each branch farm		442 75
Poultry department		85 25
Forestry department		167 00
Office help		110 00
Seed grain distribution		82 77
Tree distribution		44 00
Clearing land		431 50
Contingencies, including postage, $51.35		93 60
Printing and stationery		35 96
Books and newspapers		27 00
Telegrams		5 20
	$	8,493 25

SUMMARY.

Central Experimental Farm		$ 31,220 01
Nappan "		10,900 81
Brandon "		10,256 83
Indian Head "		9,992 01
Agassiz "		8,493 25
Seed grain distribution from Central Experimental Farm		4,137 09
Printing bulletins and distribution of bulletins and reports	$ 4,000 00	
Less special sum in estimates for this item	4,000 00	
		$ 75,000 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND DECEMBER 31, 1899.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

14 Horses	$	1,005 00
2 Ayrshire cattle		250 00
1 Durham "		75 00
4 Guernsey "		425 00
27 Grade "		653 00
4 Yorkshire swine		70 00
3 Berkshire "		72 00
2 Tamworth "		40 00
3 Poland China swine		105 00
19 Grade swine		57 00
9 Shropshire sheep		255 00
8 Leicester "		190 00
16 Grade "		64 50
Farm machinery and implements		2,527 50
Vehicles, including farm wagons and sleighs		1,086 00
Hand tools, hardware and sundries		1,090 00
Harness		250 75
Dairy department, machinery, &c.		614 00
Horticultural and Forestry departments, implements, tools, &c.		590 15
Botanical department, implements, tools, &c.		11 50
Poultry " 253 fowls		240 00
" " implements, furnishings, &c.		158 75
Bees and apiarian supplies		503 95
Chemical department, apparatus and chemicals		2,120 05
Books in several departments		474 90
Greenhouse plants, supplies, &c.		1,394 00
Furniture at Director's house		1.072 00
Office furniture and stationery		1,600 00
	$	16,695 05

EXPERIMENTAL FARM, NAPPAN, N.S.

7 Horses	$	735 00
4 Guernsey cattle		525 00
6 Holstein "		320 00
6 Ayrshire "		390 00
29 Grade "		1,078 00
2 Yorkshire swine		40 00
2 Berkshire "		35 00
3 Tamworth "		37 00
60 Grade "		250 00
38 Sheep		160 00
56 Fowls		32 75
Bees and apiarian supplies		32 50
Vehicles, including farm wagons and sleighs		335 00
Farm machinery		520 00
" implements		203 00
Hand tools, hardware and sundries		332 15
Harness		158 25
Furniture for reception room and bedroom for visiting officials		166 25
" supplies and books for office		92 00
	$	5,441 90

EXPERIMENTAL FARM, BRANDON, MANITOBA.

13 Horses	$ 1,060 00
4 Ayrshire cattle	140 00
4 Durham "	520 00
1 Guernsey "	100 00
6 Holstein "	250 00
8 Grade "	160 00
1 Chester White swine	15 00
3 Tamworth "	40 00
5 Berkshire "	55 00
7 Grade "	14 00
59 Fowls	59 00
Bees and apiarian supplies	75 70
Vehicles, including farm wagons and sleighs	497 25
Farm machinery	987 00
" implements	630 00
Hand tools, hardware and sundries	600 17
Harness	217 50
Furniture for reception room and bedroom for visiting officials	162 55
" supplied and books for office	182 40
	$ 5,765 57

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

15 Horses	$ 1,350 00
1 Ayrshire cattle	75 00
9 Durham "	775 00
1 Holstein "	50 00
17 Grade "	435 00
1 Yorkshire swine	15 00
4 Berkshire "	70 00
4 Tamworth "	67 00
1 Chester White "	10 00
71 Fowls	38 00
Bees and apiarian supplies	34 15
Vehicles, including farm wagons and sleighs	475 00
Farm machinery	1,259 00
" implements	618 00
Hand tools, hardware and sundries	446 10
Harness	197 25
Furniture for reception room and bedroom for visiting officials	168 50
" supplies and books for office	220 65
	$ 6,303 65

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$ 600 00
3 Durham cattle	120 00
4 Ayrshire "	135 00
4 Holstein "	145 00
1 Grade "	30 00
10 Dorset horned sheep	71 00
2 Berkshire swine	45 00
8 Tamworth "	100 00
7 Grade "	24 50
54 Fowls	54 00
Bees and apiarian supplies	35 95
Vehicles, including farm wagons	210 00
Farm machinery	586 00
" implements	180 00
Hand tools, hardware and sundries	155 15
Harness	56 75
Furniture for reception room and bedroom for visiting officials	205 50
" supplies and books for office	120 45
	$ 2,874 30

W. H. HAY,
Accountant.

INDEX

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

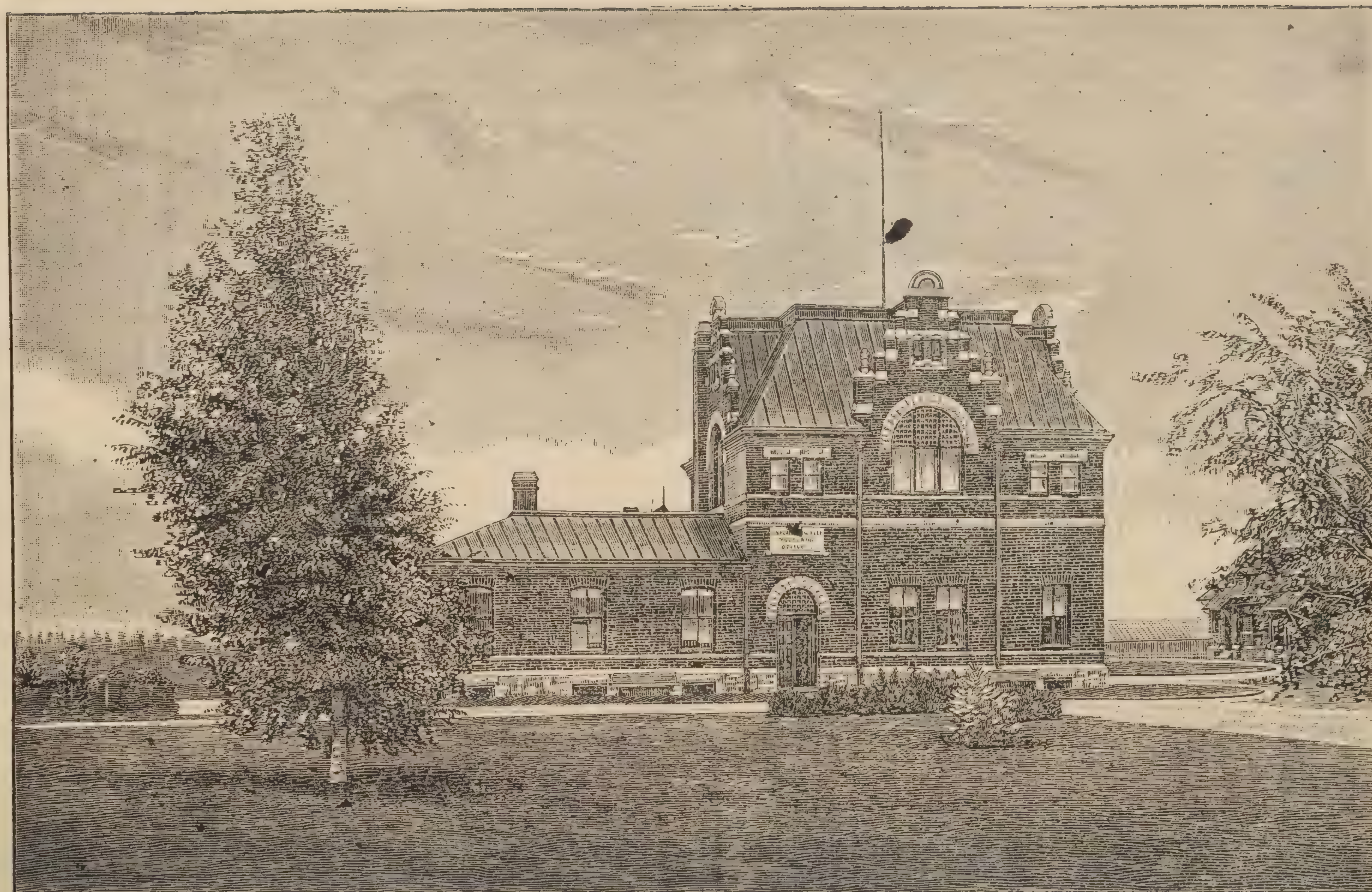
OF THE

DIRECTOR - - - - - - -	WM. SAUNDERS, LL.D.
AGRICULTURIST - - - - -	J. H. GRISDALE, B. AGR.
HORTICULTURIST - - - - - -	W. T. MACOUN
CHEMIST - - - - - - -	F. T. SHUTT, M.A.
ENTOMOLOGIST AND BOTANIST - - -	JAS. FLETCHER, LL.D.
POULTRY MANAGER - - - - -	A. G. GILBERT

FOR

1900

OTTAWA
GOVERNMENT PRINTING BUREAU
1901



OFEICE BUILDING, MUSEUM AND CHEMICAL LABORATORY OF THE CENTRAL EXPERIMENTAL FARM.

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, December 1, 1900.

SIR,—I beg to submit for your approval the fourteenth annual report of the work done, and in progress, at the several experimental farms.

In addition to my report, you will find appended, reports from the following officers of the Central Experimental Farm : From the Agriculturist, Mr. J. H. Grisdale ; from the Horticulturist, Mr. W. T. Macoun ; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon ; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms ; also of scientific investigations in the chemical laboratory and the information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms is a gratifying evidence of the desire for information among this class of the community, also of the high esteem in which these records of the work of the farms are held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR, WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.

In submitting the fourteenth annual report giving particulars of some of the operations conducted on the five experimental farms established by the Dominion Government for the benefit of farmers residing in the different climates of Canada, it is hoped that the facts presented, which are the results of careful observation and experiment, will be found of much practical utility.

The reports of the several officers engaged in the different lines of work contain much information on a variety of subjects, all bearing on practical agriculture or horticulture. The best methods of maintaining the fertility of the land, and of economizing the fertilizers produced on the farm, the most useful measures to adopt in preparing the land for crop, how and when seed should be sown, and which are the varieties which experience has shown to be the best and most productive, are all referred to. Much information is also given as to the care of cattle, swine, sheep and poultry and the most economical and profitable methods to adopt in the feeding and breeding of these different classes of stock for the production of meat, dairy products and eggs. The growing of all the different classes of fruit and vegetables has received much attention and lists have been prepared of varieties found specially suitable to certain localities and climates with particular reference to the needs of farmers. The selection and care of the many different sorts of useful timber and ornamental trees adapted to Canada has received much attention, embracing such varieties as are specially suitable for shelter belts and others adapted for the beautifying of homes.

The subjugation of insect pests and noxious weeds has claimed close observation and study, so also have the many chemical problems which present themselves in connection with agricultural pursuits, the solution of which is most important to success. These with many other useful subjects are under constant investigation and experiment. By the use of such information presented from year to year, improvements have taken place in farm life, leading to the avoidance of waste, and to economy in production, with increased profits as the result.

The interdependence of all branches of farm work and a knowledge of how these can best be carried on in conjunction so as to produce the most satisfactory returns under the varied conditions which surround the settler in different parts of the Dominion, are items of information of deep interest to farmers everywhere. The days are passing by when farmers will rest satisfied with the risky position of depending entirely on one crop. With adverse seasons, which occur more or less often in almost

every country, such men on such occasions lose ground financially, and sometimes to such an extent as to take them several years to recover. The best and happily the system most generally followed now is mixed farming. This is eminently adapted to all parts of Canada, and to the rapid growth of this system of diversified agriculture may be attributed much of the phenomenal increase in the exports of Canadian agricultural products, which has taken place during the past ten or twelve years.

During the past season the writer has had an opportunity of visiting Great Britain and France, and of noting the progress of agriculture there, and the results produced by the measures which have been adopted to assist farmers in their work, further particulars of which will be found in another part of this report. The experience gained but strengthens the opinion that Canadian farmers are well to the front in almost everything, and that there is no other country where there are so many useful measures in operation designed to assist the farmer in overcoming the difficulties he has to contend with, and to aid him in his endeavours to acquire a better practical knowledge of the important principles which underlie his useful occupation. It is gratifying to know that the farmers of this country are eager for information and always ready to take advantage promptly of every opportunity of improving their condition. With such a spirit of enterprise abroad and the enormous agricultural resources awaiting development in Canada, the future prosperity of the country is assured.

This fourteenth annual report of the work of the experimental farms is submitted to the farmers of Canada with the earnest hope that it may prove helpful to them in the great work they have in hand of advancing the agricultural interests of this country.

EXPERIMENTAL WORK

CONDUCTED AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, ONTARIO.

EXPERIMENTS WITH OATS.

Eighty-two varieties of oats have been under trial in the uniform test plots at the Central Experimental Farm during 1900. These experiments have been conducted in all cases to gain information as to the relative productiveness, earliness and other characteristics of the different sorts. The soil on which these oats were sown was a sandy loam which received a dressing of barn-yard manure during the winter of 1898-9 of about 12 tons per acre. The previous crop was turnips. After the turnips were taken off the land was drilled up in ridges 2½ feet apart and left in this condition until the following spring, when it was cultivated twice with a two-horse cultivator and twice with a smoothing harrow. The seed of all the varieties was sown on May 4, on plots of one-fortieth of an acre each, seed being used in each case at the rate of 2 bushels per acre. Among the varieties tested this year were the following thirteen cross-bred sorts, all of which have been originated on the experimental farms:—Holland, Cromwell, Olive, Oxford, Pense, Miller, Brandon, Milford, King, Medal, Kendal, Master and Russell. Waverley and Tartar King are two new cross-bred oats recently introduced by Garton Bros., of Newton le Willows, England. Longhoughton is a favourite Scotch variety, and Anderbecker, Leutewitzer, Selchower and Uberfluss have been received for test from Germany.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
1	Holstein Prolific	Aug. 14	102	46—49	Stiff......	7½— 9½	Branching	82	18	35⅕	Slightly.
2	White Giant.........	" 14	102	45—48	"	8 — 9½	" .	78	8	36¼	"
3	Black Beauty..	" 16	104	44—48	Weak ..	9 —10	" .	76	16	33⅕	Considerably.
4	Hazlett's Seizure....	" 16	104	48—52	Stiff......	8 — 9½	" .	74	24	36¼	Slightly.
5	Waverley	" 14	102	48—52	"	8 — 9½	" .	74	4	37	"
6	Oderbruch...........	" 15	103	45—49	"	8 — 9½	Half Sided	73	32	39	"
7	Calif'nia P. Blk. C.E.F	" 20	108	50—54	"	9 —10	Sided.....	72	32	32¼	Considerably.
8	Joanette..............	" 24	112	38—42	"	7 — 8	Branching	70	20	38	Slightly.
9	Early Blossom.......	" 17	105	47—51	"	7½— 8½	Half Sided	70	20	35½	"
10	Golden Tartarian	" 22	110	46—50	"	9 —10	Sided.....	69	14	33	"
11	Golden Giant........	" 22	110	36—40	"	9 —10	"	68	28	35	Considerably.
12	Holland	" 22	110	36—40	"	9 —10	"	68	8	35	"
13	Cromwell............	" 14	102	48—52	"	9 —10	Half Sided	68	8	38½	Slightly.
14	American Beauty....	" 14	102	44—48	Medium..	8½—9½	Branching	68	8	36	"
15	Olive	" 17	105	44—48	Stiff......	9 —10	Half Sided	67	22	35¾	"
16	Eureka..........	" 11	99	40—44	"	8½—10	Branching	67	22	37	"
17	Buckbee's Illinois....	" 13	101	45—48	"	8½— 9½	" .	67	2	40¼	"
18	Oxford	" 16	102	46—50	"	8 — 9	Half Sided	65	30	38	"

OATS—TEST OF VARIETIES—*Continued.*

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
19	Bavarian	Aug. 22	110	46—50	Stiff	9—10½	Branching	65	10	32½	Considerably.
20	Blk. Tartarian, C.E.F.	" 20	108	50—54	"	8½—9½	Sided	64	24	38	Slightly.
21	Banner	" 16	104	46—50	"	9—10	Branching	64	4	36	"
22	Wide Awake	" 18	106	47—51	"	8—9½	"	63	18	38½	"
23	Uberfluss	" 14	102	44—48	"	7½—8½	"	63	18	36½	"
24	Mennonite	" 19	107	40—46	Medium	7½—8½	"	63	8	37	Considerably.
25	Imp. Ligowo, C. E. F.	" 14	102	45—49	Stiff	8½—9½	"	62	12	37	Slightly,
26	Wallis	" 16	104	46—50	"	9—10	"	62	12	35	"
27	Early Archangel	" 14	102	46—50	"	8½—9½	"	61	7	41½	"
28	White Schonen	" 16	104	48—52	"	8½—9½	"	61	6	37	"
29	Early Golden Prolific.	" 17	105	43—47	Medium	8½—9½	"	61	6	34½	Considerably.
30	Flying Scotchman	" 11	99	46—50	Stiff	9—10½	"	61	6	38¾	Slightly.
31	Pense	" 17	105	46—50	"	8½—9½	Half Sided	61	6	36	Considerably.
32	Tartar King	" 10	98	38—42	"	9—10	Sided	60	20	35	Slightly.
33	Improved Ligowo Imp	" 14	102	45—49	"	8½—9½	Branching	60	—	37	"
34	Prize Cluster	" 10	98	42—46	"	7—8	"	60	—	41¾	"
35	New Zealand	" 25	113	46—50	"	9—10	Sided	60	—	35¼	"
36	Welcome	" 11	99	40—45	Medium	8—9	Branching	60	—	39½	"
37	Prol. Blk. Tartarian Im	" 20	108	50—54	Stiff	8½—9½	Sided	59	14	36	"
38	Anderbecker	" 15	103	44—48	"	8½—10	Branching	59	14	35¼	"
39	California Prol. Blk, Im	" 20	108	50—54	"	9—10	Sided	59	14	33	Considerably.
40	American Triumph	" 19	107	45—49	"	8—9½	Branching	58	28	34	Slightly.
41	Great Northern	" 15	103	35—40	"	7½—8½	"	58	28	36¼	"
42	Thousand Dollar	" 13	101	46—49	"	8—9	"	58	8	38½	"
43	Danish Island	" 17	105	34—38	Weak	6½—8	"	58	8	35	Badly.
44	Abundance	" 22	110	40—45	"	8—9	"	58	8	33¾	Considerably.
45	Columbus	" 14	102	36—40	Medium	7½—8½	"	57	22	34¼	Slightly.
46	Abyssinia	" 16	104	46—50	Stiff	7—8	Half Sided	57	22	39	Badly.
47	Early Maine	" 14	102	40—44	Weak	7½—8½	Branching	57	2	37	Considerably.
48	Miller	" 16	104	46—50	Stiff	8½—9¾	"	56	16	36½	"
49	Liberty	" 15	103	38—42	"	8—9	"	56	16	36	"
50	Newmarket	" 15	103	45—50	Weak	8—9½	"	56	16	38	"
51	Poland	" 11	99	40—45	Stiff	7½—9	"	56	16	38	Slightly.
52	Brandon	" 22	110	44—48	"	8½—10	Half Sided	55	10	34	Considerably.
53	Lincoln	" 15	103	45—50	"	8½—9½	Branching	55	10	36¾	Slightly.
54	Golden Beauty	" 24	112	46—50	"	8½—10	"	54	4	35	Considerably.
55	Rosedale	" 14	102	40—43	"	7½—8½	Half Sided	54	4	40¾	"
56	Victoria Prize	" 10	98	40—45	Medium	7—8	Branching	54	4	42½	"
57	Milford	" 17	105	40—45	Stiff	8—10	Half Sided	52	32	40	Slightly.
58	Bayonet	" 11	99	36—42	"	8—9	Branching	52	32	39½	"
59	Salines	" 25	113	40—46	"	7½—8½	"	51	26	35	Badly.
60	Longhoughton	" 16	104	44—48	"	8—9	"	51	26	31½	Slightly.
61	Sensation	" 14	102	45—48	"	8—9½	"	51	26	38	"
62	White Russian	" 17	105	45—50	"	7½—8½	"	51	26	39	"
63	Early Gothland	" 14	102	45—50	"	7½—8½	Half Sided	51	26	40¼	"
64	Imported Irish	" 13	101	45—50	Weak	8—9	Branching	51	26	40½	Considerably.
65	Siberian	" 20	108	46—50	Stiff	8—9	"	50	20	36	"
66	King	" 18	106	40—46	Medium	7½—9	"	50	20	36	Slightly.
67	Leutewitzer	" 20	108	38—42	"	7½—9	"	50	20	31¾	"
68	Improved American	" 17	105	44—48	Stiff	8—9½	"	50	20	35½	"
69	Bonanza	" 10	98	36—40	Weak	7½—8½	"	50	20	42½	"
70	Medal	" 16	104	46—50	Stiff	8½—9½	Half Sided	50	20	38	Considerably.
71	Kendal	" 23	111	38—42	Weak	7½—8½	"	48	8	35¼	Badly.
72	Early Dawson	" 9	97	36—40	"	7½—9	Branching	47	22	40¼	Considerably.
73	Coulommiers	" 24	112	36—40	"	8—9	"	47	2	37½	Badly.
74	Selchower	" 20	108	40—46	Stiff	7—8	Sided	47	2	34	Slightly.
75	Mortgage Lifter	" 10	98	36—40	"	8½—10	Branching	47	2	41¼	Considerably.
76	White Wonder	" 9	97	40—43	Weak	8—9	"	47	2	42	"
77	Doncaster Prize	" 16	104	39—44	"	8½—9½	"	42	24	35¾	Badly.
78	Master	" 16	104	45—50	Stiff	8—9	Half Sided	42	12	37¼	Slightly.
79	Black Mesdag	" 13	101	44—47	"	8—9	Branching	41	6	37	Considerably.
80	Russell	" 17	105	40—45	"	8—9	Half Bra'h	41	6	35¾	"
81	Cream Egyptian	" 20	108	36—42	Weak	7½—8½	Half Sided	35	30	36½	"
82	Winter Grey	" 19	107	35—40	"	6½—8	Branching	35	10	40	Badly.

EXPERIMENTS WITH OATS GROWN AFTER DIFFERENT CROPS.

During the past season six plots, one-fortieth acre each, have been used in this test to ascertain what effect different crops have on the soil they are sown upon, and how far they influence a subsequent oat crop. The soil in this instance was a sandy loam of good quality. After the crops were taken off last autumn, the land was gang-ploughed shallow, and later in the fall it was ploughed to the depth of about 7 inches. In the spring of 1900 it was harrowed twice with disc-harrow and twice with smoothing harrow, and all sown with Sensation oats at the rate of 2 bushels per acre on May 4. They were cut on August 14, with the following results:—

Previous Crop in 1899.	Sensation Oats in 1900 Yield per acre.		Length of Straw.	Length of Head.
	Bush.	lbs.	Inches.	Inches.
Plot 1 Flax	49	14	40—45	8—9½
Plot 2 Grain	58	28	43—48	8½—9½
Plot 3 Horse Beans	69	14	46—50	9—10
Plot 4 Soja Beans	49	14	40—45	8½—9½
Plot 5 Corn	52	32	40—45	8½—9½
Plot 6 Millet	43	18	36—40	7¾—8½

EXPERIMENTS WITH BARLEY.

Fifty-nine varieties of barley have been under test in the uniform trial plots for 1900. Twenty-four of these have been two-rowed sorts and thirty-five six-rowed. The land chosen for the barley plots was a heavy sandy loam, mixed with clay. The previous crop was clover hay. The land was ploughed late in the autumn to the depth of about 7 inches and left in that condition until the following spring, when it was harrowed twice with the disc-harrow and twice with the smoothing harrow before sowing. The size of the plots was one-fortieth of an acre each, and they were all sown on May 1, the two-rowed at the rate of 2 bushels per acre and the six-rowed at the rate of 1¾ bushels per acre. The seed of all these varieties of barley, both two-rowed and six-rowed, was obtained from selected heads picked carefully by hand, the largest and plumpest being chosen.

Among the varieties tested this year are the following hybrid sorts, all of which have been produced at the experimental farms:—Sixteen two-rowed barleys: Beaver, Bolton, Gordon, Jarvis, Clifford, Harvey, Dunham, Victor, Nepean, Fulton, Sidney, Logan, Pacer, Leslie, Monck and Rigid, and twenty-one six-rowed sorts, namely: Pioneer, Royal, Argyle, Summit, Albert, Vanguard, Claude, Surprise, Success, Nugent, Trooper, Mansfield, Stella, Garfield, Empire, Phœnix, Yale, Brome, Parkin, Munro and Lytton. The last four named are new hybrids which have been introduced this year. The following is their parentage:—

No. 18. Parkin Beardless—Royal, six-rowed bearded female; Success, six-rowed beardless male.

No. 19. Munro Bearded—Royal, six-rowed bearded female; Success, six-rowed beardless male.

No. 20. Lytton—Royal, six-rowed female; Beaver, two-rowed male.

No. 21. Pelham—Royal, six-rowed female; Beaver, two-rowed male.

Royal, the female parent of Parkin and Munro, is a hybrid between a two-rowed barley, known as Swedish, and a plump six-rowed variety, known as Baxter. Success is a beardless barley. One of the crosses, Parkin, is beardless, like the male parent; the other is bearded and resembles Royal.

In the third case, Lytton is a cross with Royal six-rowed and Beaver two-rowed. Beaver was one of the earlier hybrids, the result of a cross between a two-rowed sort (Swedish) and a six-rowed Baxter. In this case, although in parentage it is two-thirds two-rowed, this barley is, nevertheless, a six-rowed sort. Pelham is a two-rowed sort. The three parents of these hybrids have been very productive.

Nos. 18 and 19 are crosses which were made by the present Horticulturist of the Central Experimental Farm, Mr. W. T. Macoun, in 1895. Nos. 20 and 21 are the work of Dr. C. E. Saunders, in 1896.

Two-Rowed Barley—Test of Varieties.

	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs	
1	Canadian Thorpe	Aug.	7	98	35—38	Very stiff	3—4	58	16	50	Slightly.
2	French Chevalier	"	6	97	33—36	Weak	3¼—4½	56	32	48	Badly.
3	Beaver	"	6	97	35—38	"	3—3¾	54	8	49¼	"
4	Bolton	"	4	95	33—36	Stiff	3—3¾	52	24	51¼	Slightly.
5	Danish Chevalier	"	6	97	33—36	Weak	3¼—4	51	32	49	Considerably.
6	Gordon	"	6	97	40—43	Stiff	3—3½	50	40	49¼	Slightly.
7	Jarvis	"	6	97	39—42	"	3—4	50	20	50	"
8	Newton	"	8	99	38—41	"	3—3¾	50	..	50¼	Considerably.
9	Clifford	"	6	97	38—41	"	3—4	50	..	49	Slightly.
10	Harvey	"	4	95	40—43	"	3—3¾	50	..	50	"
11	Dunham	"	8	99	40—43	"	3¼—4¼	49	8	48½	"
12	Victor	"	6	97	40—43	Medium	3¼—4	49	8	48½	Considerably.
13	Nepean	"	8	99	40—44	"	3—4	49	8	50	Slightly.
14	Fulton	"	8	99	40—43	Stiff	3—3¾	47	44	48	"
15	Sidney	"	4	95	34—38	"	3—3¾	45	..	50	"
16	Logan	"	8	99	39—42	Medium	3—4	43	16	48¾	"
17	Pacer	"	4	95	40—43	Stiff	3—3¾	43	16	50	"
18	Pelham	"	6	97	32—35	Medium	3¼—4¼	42	24	48¾	Considerably.
19	Leslie	"	6	97	35—38	Stiff	3—4	40	40	44	Slightly.
20	Kinver Chevalier	"	6	97	33—36	Weak	3—4	37	44	44	Badly.
21	Monck	"	8	99	36—40	Stiff	3—3¾	35	40	51	Considerably.
22	Improved Thanet	"	10	101	35—38	Weak	3¼—4¼	30	40	44	Badly.
23	Rigid	"	9	100	39—42	"	3¼—4¼	29	8	49¾	Considerably.
24	Prize Prolific	"	14	105	32—35	"	3—4	26	46	46	Badly.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.	Bush.	Lbs.	Lbs	
1	Mensury	Aug. 3	94	36—39	Stiff	2¾—3¾	60	..	48	Slightly.
2	Pioneer	" 3	94	37—40	"	2½—3¼	60	..	45½	"
3	Common	July 31	91	31—34	Medium	2 —3	59	8	48	"
4	Salzer's Silver King	Aug. 7	98	36—38	Stiff	3 —3¾	58	16	46½	"
5	Royal	" 2	93	30—33	Medium	2 —2¾	58	8	47	"
6	Argyle	" 3	94	35—38	Stiff	2¼—3½	56	32	48	"
7	Odessa	" 2	93	33—36	Medium	2½—3	55	..	47	"
8	Petschora	July 31	91	33—35	"	3 —3½	54	8	44	Considerably.
9	Summit	Aug. 4	95	31—34	Weak	2 —3	54	8	48½	"
10	Albert	" 3	94	35—38	Stiff	2 —3	53	16	49½	"
11	Vanguard	" 1	92	32—34	"	2 —3¼	52	44	46	Slightly.
12	Oderbruch	" 3	94	34—37	Weak	2½—3¼	52	24	48½	Considerably.
13	Claude	" 3	94	33—36	Stiff	2¼—3¼	51	32	45½	Slightly.
14	Surprise	" 4	95	28—31	Weak	2 —3	51	32	47¾	Considerably.
15	Success	July 28	88	29—31	Medium	2 —2½	50	40	45	Slightly.
16	Parkin	" 31	91	28—30	Weak	2 —2½	50	40	46	Considerably.
17	Munro	" 31	91	30—32	"	2 —2¾	50	40	48	"
18	Nugent	Aug. 1	92	36—40	Stiff	2¾—3½	50	..	48	Slightly.
19	Blue Short Head	" 8	99	29—32	"	2 —2¼	50	..	43	Considerably.
20	Hulless Black	" 1	92	28—30	Weak	1½—2	48	36	60½	Slightly.
21	Trooper	" 2	93	34—37	Medium	2½—3¼	47	4	49	"
22	Lytton	" 2	93	29—32	"	2¼—3¼	47	4	....	"
23	Excelsior	" 4	95	35—38	Stiff	2 —3	46	32	43½	Considerably.
24	Champion	" 1	92	35—37	"	2½—3¼	45	40	43¾	Slightly.
25	Rennie's Improved	" 1	92	33—36	Medium	2½—3	45	20	45	"
26	Mansfield	" 2	93	37—40	"	2½—3¼	45	..	45	"
27	Stella	" 1	92	32—34	Stiff	2 —3	43	36	45¾	"
28	Garfield	" 4	95	35—38	"	2½—3	43	36	47¾	"
29	Empire	" 2	93	34—37	"	2 —2¾	43	36	49¼	"
30	Blue Long Head	July 31	91	33—36	Weak	2½—3	43	16	44	Badly.
31	Baxter	Aug. 2	93	34—37	Medium	2½—3¼	41	32	47	Considerably.
32	Phœnix	" 1	92	33—36	Stiff	2½—3	41	32	43½	Slightly.
33	Yale	" 7	98	33—36	Medium	2¼—3¼	41	32	45½	Considerably.
34	Brome	" 3	94	33—36	"	2½—3	40	40	46½	"
35	Hulless' White	" 1	92	30—33	Weak	2 —2½	39	8	53	Slightly.

BARLEY GROWN FROM SCREENED SEED.

While all the uniform trial plots of barley were grown, as already stated, from seed obtained from carefully selected heads, the seed of the following ten varieties was not from selected heads. After the barley plots were threshed, the grain for this purpose was passed through the fanning mill to take out the small kernels, and the clean, plump seed remaining was saved.

Six of these varieties were six-rowed and four were two-rowed, and the following are the results. It will be seen that in every instance but one the seed from selected heads has given the larger crops, the increase per acre varying from 40 pounds to 8 bushels and 40 pounds. The one exception was a two-rowed sort, the Danish Chevalier, which gave a crop of 2 bushels 24 pounds less per acre from the selected heads. These were all sown on the same day as the uniform trial plots, May 1; the plots were adjoining, with similar soil and similarly treated, the size in each case being one-fortieth of an acre.

RESULTS of sowing Screened Seed compared with Selected.

Number	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	From Screened Seed. — Yield per Acre.		From Selected Heads. — Yield per Acre.	
	Six-rowed.			Inches.		Inches.	Bush.	Lbs.	Bush.	Lbs.
1	Mensory	Aug. 3	....	36 to 39	Stiff	2½ to 3½	56	32	60	..
2	Odessa	" 2	...	33 to 36	"	2 to 3	50	40	55	..
3	Royal	" 2	....	30 to 33	Medium	2 to 2½	50	..	58	8
4	Petschora	July 31	....	33 to 35	"	2½ to 3	49	8	54	8
5	Champion	Aug. 1	....	35 to 37	Stiff	2 to 3	45	..	45	40
6	Trooper	" 4	....	32 to 35	"	2 to 3	43	16	47	4
	Two-rowed.									
1	Danish Chevalier	Aug. 6	....	33 to 36	Weak	3¼ to 4	54	8	51	32
2	Beaver	" 6	....	34 to 37	"	3 to 3½	50	..	54	8
3	Canadian Thorpe	" 7	...	35 to 38	Stiff	2¾ to 3¼	49	28	58	16
4	Sidney	" 4	....	34 to 38	"	3 to 3½	43	16	45	..

FORMALIN AND MASSEL POWDER AS PREVENTIVES OF SMUT IN OATS AND BARLEY.

Three varieties of grain were used in this experiment, viz.: Doncaster Prize oats and Odessa and Canadian Thorpe barleys. These were all sown on May 23, in plots 33 feet long, in rows 9 inches apart; four rows in each test, the heads of which were counted when the smut was fully advanced. The grain used for seed in each case was quite smutty.

OATS.

Name of Variety.	How Treated.	Preventive used.	Good Heads.	Smutty Heads.
Doncaster Prize	Soaked 1 hour	Formalin 4½ ounces to 10 gallons water	2,612	21
"	" 15 minutes	" 4½ " "	2,632	14
"	" 5 "	" 4½ " "	2,581	15
"	Sprinkled	" 9 " "	2,602	19
"	Untreated	....	2,642	28
"	Soaked 10 minutes	Massel powder with lime	2,592	14

BARLEY.

Odessa	Soaked 1 hour	Formalin, 4½ ounces to 10 gallons water	2,701	22
"	" 15 minutes	" 4½ " "	2,642	18
"	" 5 "	" 4½ " "	2,706	17
"	Sprinkled	" 9 " "	2,726	24
"	Untreated	....	2,742	31
"	Soaked 10 minutes	Massel powder with lime	2,638	27
Canadian Thorpe	" 1 hour	Formalin, 4½ ounces to 10 gallons water	2,289	12
"	" 15 minutes	" 4½ " "	2,309	16
"	" 5 "	" 4½ " "	2,823	14
"	Sprinkled	" 9 " "	2,532	16
"	Untreated	....	2,621	26
"	Soaked 10 minutes	Massel powder with lime	2,298	14

EXPERIMENTS WITH FALL WHEAT.

The number of varieties of fall wheat under trial during the past season was twenty-two. Their names were as follows:—Poole, Gold Coin, Dawson's Golden Chaff, Bonnell, Standard, Winter King, Early Ripe, Red Velvet Chaff, Jones' Winter Fife, Pride of Illinois, American Bronze, Early Red Clawson, Russian Amber, Long Berry Red, Early Gennessee Giant, Buda Pesth, Reliable, Golden Cross, Imperial Amber, Tasmania Red, Egyptian and Velvet Chaff. These were all sown in plots of one-fortieth acre each, on September 13, 1899. The winter was unfavourable for this crop, and in the spring of 1900 all the plots were found to be so badly winter-killed that they were not worth leaving, and were ploughed under.

EXPERIMENTS WITH SPRING WHEAT.

Seventy-two varieties of spring wheat have been tested in the uniform trial plots during the past season. The soil was a heavy sandy loam of fairly good quality, slightly mixed with clay, which received a dressing of about 15 tons of barn-yard manure per acre in the spring of 1897. No fertilizer has been applied since. The previous crop was hay. The land was ploughed late in the autumn to the depth of about seven inches, and left in that state until the following spring, when it was harrowed twice with the disc-harrow and twice with the smoothing harrow before sowing. The size of the plots was one-fortieth acre each; they were all sown on April 28, using at the rate of one bushel and a half of seed per acre.

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Bush	Lbs.	Lbs.	
1	Huron	Aug. 13	107	43—47	Stiff	3 —3¾	Bearded	38	40	60¾	Slightly.
2	Wellman's Fife	" 14	108	45—49	"	3¼—4	Beardless	35	20	58	"
3	Blenheim	" 13	107	40—43	"	2½—3½	Bearded	34	40	60½	"
4	Preston	" 11	105	42—45	"	3 —4	"	34	..	60¾	"
5	Laurel	" 15	109	46—50	"	3 —4	Beardless	33	40	59	"
6	Colorado	" 9	103	40—43	"	2½—3½	Bearded	33	20	61	"
7	Captor	" 9	103	38—41	"	3 —3¾	Beardless	32	40	59½	"
8	Red Fern	" 13	107	40—43	"	3 —3¾	Bearded	32	40	61	"
9	White Russian	" 14	108	45—49	"	3¼—4	Beardless	32	40	60	"
10	Weldon	" 10	104	37—40	"	3 —3¾	"	32	40	61	"
11	Red Fife	" 16	110	38—42	"	3 —3½	"	32	..	59¾	"
12	Pringle's Champlain	" 13	107	38—42	"	3 —4	Bearded	32	..	61¼	"
13	Admiral	" 1[illegible]	106	40—45	"	2½—3½	Beardless	31	20	58¾	"
14	Dion's	" 1[illegible]	107	40—43	"	3 —4	Bearded	31	20	61½	"
15	Crown	" 1[illegible]	106	40—44	"	2¾—3¾	"	31	20	60½	"
16	Roumanian	" 17	111	43—47	"	2 —3¼	"	31	20	62½	Considerably.
17	Stanley	" 1[illegible]	104	40—43	"	3 —4	Beardless	30	40	59	"
18	Harold	" 4	98	33—35	Weak	2 —2¾	Bearded	30	40	58½	"
19	Clyde	" 13	107	38—42	Stiff	3 —3½	Beardless	30	40	60	Slightly.
20	Plumper	" 7	101	37—40	"	2½—3¼	Bearded	30	20	61	Considerably.
21	Monarch	" 15	109	42—46	"	3 —4	Beardless	30	..	58½	Slightly.
22	Beauty	" 13	107	42—46	"	3 —4	"	30	..	59	"
23	Crawford	" 9	103	40—43	Medium	3 —3¾	"	30	..	59	"
24	No. 19 (Australian)	" 16	110	43—47	Stiff	3 —3¾	"	30	..	59½	"
25	Percy	" 11	105	42—45	"	3 —3¾	"	30	..	60½	"
26	No. 9 (Australian)	" 16	110	43—47	"	2½—3½	"	30	..	59½	Considerably.
27	Byron	" 11	105	35—40	Weak	2½—3½	Bearded	30	..	59	"
28	Chester	" 10	104	40—44	Stiff	3 —3½	Beardless	30	..	....	"

SPRING WHEAT—TEST OF VARIETIES—*Continued.*

Number.	Name of Variety.	Date of Ripening.	Number of days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Bush	Lbs.	Lbs.	
29	Cartier	Aug. 10	104	35—38	Weak	2½—3½	Bearded	29	40	60¾	Considerably.
30	Goose	" 17	111	43—47	Stiff	2—3¼	"	29	20	62¾	"
31	Advance	" 12	106	42—45	"	3—4	"	29	20	60¾	Slightly.
32	Fraser	" 9	103	38—42	"	2½—3¼	"	29	20	59¾	Considerably.
33	No. 25 (Australian)	" 10	104	40—45	"	3—3½	Beardless	28	40	59	Slightly.
34	Blair	" 9	103	39—42	"	3—3½	Bearded	28	40	60½	Considerably.
35	No. 10 (Australian)	" 16	110	44—48	"	3—3½	Beardless	28	..	57	Slightly.
36	No. 23 (Australian)	" 14	108	42—46	"	3—3¾	"	28	..	....	"
37	White Fife	" 14	108	38—42	"	3—3½	"	28	..	59¾	"
38	Black Sea	" 8	102	40—44	"	3¼—4¼	Bearded	27	40	59	Considerably.
39	Cassel	" 15	109	36—39	Medium	3—3¾	Beardless	27	40	60	"
40	Alpha	" 13	107	40—44	Stiff	3—3½	"	27	20	60¾	Slightly.
41	No. 27 (Australian)	" 15	109	40—42	"	3—4	"	27	20	58½	"
42	White Connell	" 16	110	46—50	"	3—3½	"	27	..	59	"
43	Boyle	" 15	109	38—42	"	3—3¾	"	27	..	60	"
44	Rio Grande	" 15	109	44—48	Medium	3—3¾	Bearded	26	40	60½	"
45	Beaudry	" 12	106	38—42	Weak	2¼—3¼	"	26	40	59½	Badly.
46	Norval	" 7	101	34—37	Stiff	3—3¾	"	26	40	60	Considerably.
47	Mason	" 10	104	36—39	Weak	3—3¾	Beardless	26	40	60	Badly.
48	Progress	" 13	107	44—47	Stiff	3—3¾	"	26	20	60½	Slightly.
49	Ebert	" 7	101	40—43	"	3—3½	"	26	20	60½	Considerably.
50	Florence	" 13	107	35—39	Medium	2½—3½	Bearded	26	..	59	"
51	Herisson Bearded	" 13	107	35—40	"	2—2¾	"	26	..	62	"
52	Robins' Rust Proof	" 14	108	38—42	Weak	3—3½	Beardless	26	..	57½	Badly.
53	Vernon	" 13	107	38—42	Stiff	3—3¾	Bearded	26	..	59½	Slightly.
54	Powell	" 15	109	40—45	"	3—3½	Beardless	26	..	60	"
55	Hungarian	" 16	110	42—46	Medium	3—3¾	Bearded	25	40	61¾	Considerably.
56	Early Riga	" 6	100	34—37	Weak	2½—3½	Beardless	25	20	59	Badly.
57	White Chaff, Campbell's	" 10	104	40—45	Stiff	3—3½	"	25	20	56	Slightly.
58	Bishop	" 10	104	40—43	Weak	3—3½	"	25	20	59½	Badly.
59	Rideau	" 13	107	38—42	Stiff	2½—3½	"	25	20	57	Slightly.
60	Duff No. 13 (Australian)	" 16	110	43—46	"	3—3¾	"	25	..	57	"
61	Dawn	" 11	105	40—44	"	3—3¾	"	24	40	59	Considerably.
62	Ladoga	" 7	161	36—40	"	2¾—3½	Bearded	24	..	59	Slightly.
63	Japanese	" 8	102	34—37	Weak	2½—3	"	24	..	58	Considerably.
64	Angus	" 13	107	38—42	Medium	3—3¾	Beardless	22	40	59½	"
65	Red Swedish	" 10	104	40—45	Weak	3—3¾	Bearded	22	..	57½	Badly.
66	Countess	" 11	105	40—45	Stiff	2½—3½	Beardless	22	..	60	Considerably.
67	Essex	" 16	110	45—49	Weak	3—4	"	21	20	56	"
68	Dawson	" 16	110	45—49	"	3—3¾	"	20	40	56	"
69	Dufferin	" 11	105	42—46	Medium	2¾—3½	Bearded	19	20	58	Badly.
70	Benton	" 16	110	37—40	Weak	3—3½	Beardless	19	..	57	"
71	Hastings	" 14	108	36—40	"	2—3	"	18	..	59	"
72	Polonian	" 17	111	36—40	Stiff	4—5	....	13	20	53	"

In the foregoing list there are included forty-two of the new cross-bred sorts, which have been originated at the experimental farms. The names of these cross-bred sorts are :—Huron, Blenheim, Preston, Laurel, Captor, Weldon, Admiral, Crown, Stanley, Harold, Clyde, Plumper, Beauty, Crawford, Percy, Byron, Chester, Cartier, Advance, Fraser, Blair, Cassel, Alpha, Boyle, Norval, Mason, Progress, Ebert, Florence, Vernon, Powell, Early Riga, Bishop, Rideau, Dawn, Angus, Countess, Essex, Dawson, Dufferin, Benton, Hastings. The origin and parentage of all these, excepting three, will be found in the annual reports for 1896-7 and 1897-8. The three now added are the following :—

No. 43, Boyle, Beardless—Red Fife, female ; Ladoga, male.

No. 44, Florence, Bearded—Alpha, female ; Hard Red Calcutta, male.

No. 45, Powell, Beardless—Red Fife, female ; Hard Red Calcutta, male.

Of these results in cross-fertilizing, No. 43 was originated by the Director at the Central Experimental Farm in 1890, and 44 and 45 by Dr. A. P. Saunders in 1892, No. 44 at the Experimental Farm at Agassiz, B.C., and No. 45 at the Experimental Farm at Indian Head, N.W.T.

SPRING WHEAT GROWN FROM SCREENED SEED.

All the uniform trial plots of spring wheat were grown from seed obtained from carefully selected heads; the seed of the following eight varieties was not from selected heads. After the wheat plots were threshed, the grain for this purpose was passed through the fanning mill to separate the small kernels, and the clean plump seed remaining was saved. These eight varieties were all sown on plots of one-fortieth acre each, adjoining the uniform test plots; the soil and preparation was the same, and they were sown on the same day, April 28.

RESULTS of sowing Screened Seed compared with Selected Heads.

Number.	Name of Variety.	From Screened Seed. — Yield per Acre		Weight per Bushel.	From Selected Heads — Yield per Acre		Weight per Bushel.
		Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.
1	White Russian	32	40	59	32	40	60
2	Preston	32	..	61	34	..	60¾
3	Wellman's Fife	32	..	60½	35	20	58
4	Colorado	29	..	59¼	33	20	61
5	White Fife	28	..	60	28	..	59¾
6	Stanley	27	20	59¾	30	40	59
7	Percy	26	40	59¾	30	..	60½
8	Red Fife	25	20	60½	32	..	59¾

It will be seen that the seed from selected heads has given larger crops in every instance excepting two, White Russian and White Fife, where the yield was the same.

EXPERIMENTS WITH PEASE.

Fifty-six varieties of pease have been under trial in the uniform test plots during the past season. The ground chosen for this test was adjoining that of the uniform trial plots of oats, the soil was similar and the preparation and treatment of the land the same. The previous crop was mangels and sugar beets. The size of the plots was one-fortieth acre each, and all were sown on May 7, at the rate of 2 or 2½ bushels per acre, according to the size of the pea.

Pease—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.
					Inches.	Inches.	Bush.	Lbs.	Lbs.
1	Golden Vine	Aug. 24..	109	Strong	58—64	1½—2	40	..	63
2	Fergus	" 27..	112	"	60—68	1½—2	38	40	62½
3	Paragon	" 22..	107	Medium	48—54	2—2¾	36	..	63½
4	Early Britain	" 21..	106	"	52—58	2½—2¾	35	20	59½
5	Duke	" 27..	112	Strong	54—60	1½—2¼	35	20	62
6	Fenton	" 26..	111	"	60—70	1½—2¼	33	20	60
7	Mummy	" 25..	110	Medium	50—56	1½—2¼	33	20	62
8	Harrison's Glory	" 20..	105	"	40—46	2—3	32	40	61
9	Prince	" 27..	112	Strong	60—66	1¾—2½	32	..	62
10	Chancellor	" 18..	103	"	60—70	2—2½	31	40	62½
11	New Potter	" 27..	112	"	60—70	2—2½	30	40	61½
12	Lanark	" 25..	110	Medium	55—62	1¾—2¼	30	40	61½
13	Kent	" 25..	110	Strong	62—70	1¾—2¼	30	20	62
14	Oddfellow	" 18..	103	Medium	40—46	1½—2½	30	..	65
15	Arthur	" 18..	103	Strong	40—45	2—3	30	..	63½
16	Dover	" 29..	114	"	58—64	2—2½	29	20	63½
17	Prussian Blue	" 27..	112	"	55—62	1¾—2½	28	40	62½
18	Wisconsin Blue	" 27..	112	Medium	56—62	1½—2¼	28	40	62
19	White Wonder	" 18..	103	"	30—36	2—2½	28	..	62½
20	Elephant Blue	" 25..	110	Strong	50—56	1¾—2¼	28	..	62
21	Bright	" 29.	114	"	58—64	1¾—2¼	27	20	62
22	Large White Marrowfat	" 28..	113	"	60—70	2—2½	27	20	62½
23	Nelson	" 20..	105	"	45—50	2½—2¾	27	..	62¾
24	English Gray	" 21..	106	"	50—56	2—2¾	26	40	60
25	Canadian Beauty	" 23..	108	"	55—60	2—3	26	..	63
26	Black-eyed Marrowfat	" 27..	112	"	60—66	2—2½	26	..	61
27	Picton	" 25..	110	"	55—60	2¼—2¾	26	..	62
28	Perth	" 22..	107	Medium	40—46	2—3	25	40	61½
29	Creeper	" 23..	108	"	50—58	1—2¼	25	20	62½
30	Daniel O'Rourke	" 20..	105	"	45—50	1½—2	25	20	62½
31	German White	" 20..	105	Strong	50—56	2—2¾	25	20	61½
32	Pearl	" 26..	111	"	50—56	2—2¾	25	20	62
33	Centennial	" 27..	112	"	55—60	1¾—2¼	25	20	62½
34	Alma	" 23..	108	"	50—56	2—2½	25	..	63
35	Gregory	" 20..	105	"	55—62	2—2½	24	40	62
36	King	" 25..	110	"	56—62	1½—2	24	..	62½
37	Pride	" 22..	107	Weak	40—46	1½—2	24	..	62½
38	Agnes	" 22..	107	Strong	58—64	2—3	24	..	63
39	Archer	" 27..	112	"	65—75	1½—2¼	24	..	63
40	Crown	" 25..	110	Medium	55—60	1¼—2	23	20	62½
41	Vincent	" 25..	110	"	46—54	1¾—2¼	23	20	61
42	Victoria	" 20..	105	Strong	50—60	2—2¾	23	20	62¼
43	Macoun	" 22..	107	"	52—60	2—2¾	23	20	62
44	Trilby	" 24..	109	"	58—64	1½—2	22	40	60½
45	Carleton	" 26..	111	"	60—70	1¾—2¼	22	..	62
46	Prince Albert	" 26..	111	"	58—64	1½—2	22	..	62
47	Mackay	" 24..	109	"	50—56	2—2½	22	..	62
48	Herald	" 27..	112	"	54—60	2—2½	22	..	63
49	Cooper	" 20..	105	Medium	60—65	2—2½	20	40	62½
50	French Canner	" 18..	103	"	45—50	2—2¾	20	40	61¼
51	Bruce	" 27..	112	"	50—58	1½—2¼	20	..	62
52	Elder	" 21..	106	Strong	48—50	1¾—2½	19	20	62
53	Elliot	" 25..	110	"	55—65	2—2¾	19	20	62
54	Bedford	" 24..	109	"	58—65	1¾—2½	18	..	62½
55	Chelsea	" 25..	110	"	60—66	1¾—2¼	18	..	62½
56	Multiplier	" 27..	112	"	62—68	1½—2	17	20	62

The foregoing list includes the following thirty cross-bred sorts, all of which have been originated at the experimental farms :—Fergus, Duke, Fenton, Prince, Lanark, Kent, Arthur, Dover, Bright, Nelson, Picton, Perth, Pearl, Alma, Gregory, King, Agnes, Archer, Vincent, Macoun, Trilby, Carleton, Mackay, Herald, Cooper, Bruce, Elder, Elliot, Bedford and Chelsea.

Plate 1.—Road Planting on Main Drive leading to Office Building, Central Experimental Farm, Ottawa, Ont.
(All of these trees and shrubs have been planted since 1887).

EXPERIMENTS WITH INDIAN CORN.

Thirty-four varieties of Indian corn were tested during the season of 1900, side by side, on fairly uniform land. The soil was a sandy loam of fairly good quality, which received a dressing of barn-yard manure, about twelve tons to the acre, during the winter of 1899-1900. This was placed on the frozen land fresh from the barn-yard, in small heaps of about one-third of a cart-load each, and spread and ploughed under in the spring. The previous crop was barley. The land was gang-ploughed shallow shortly after harvest to start weed seeds and shed grain, and ploughed again in the autumn seven or eight inches deep. In the spring of 1900, after the manure was ploughed under, it was harrowed twice with the smoothing harrow before sowing. The corn was sown with the seed drill, in rows three feet apart; when the plants were from five to seven inches high they were thinned so as to leave them from six to eight inches apart in the rows.

The varieties were all sown on May 25, and were cut for ensilage on September 12. The yield per acre has been calculated from the weight of the crop cut from two rows, each 66 feet long.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre grown in rows.	
			Inches.		September 12.	Tons.	Lbs.
1	Thoroughbred White Flint	Very strong.	100 to 112	Very leafy	Late milk	24	1,280
2	Red Cob Ensilage	"	108 to 120	Leafy	Early milk	23	1,740
3	Early Mastodon	Strong.	100 to 120	Very leafy	Late milk	23	1,300
4	Giant Prolific Ensilage	"	96 to 112	Leafy	Early milk	23	1,300
5	Superior Fodder	Very strong.	108 to 120	"	"	23	640
6	Salzer's All Gold	Strong.	96 to 108	"	Late milk	23	310
7	Champion White Pearl	"	110 to 120	Very leafy	"	23	200
8	Mammoth Cuban	"	90 to 102	Leafy	"	23	200
9	Longfellow	"	84 to 96	"	"	22	110
10	Angel of Midnight	"	86 to 96	"	Glazed	22	
11	Canada White Flint	"	90 to 100	"	Late milk	22	
12	White Cap Yellow Dent	"	86 to 100	"	Glazed	21	1,780
13	Cloud's Early Yellow	"	120 to 133	"	Late milk	21	900
14	Mammoth Eight-rowed Flint	"	84 to 102	"	Doughy	21	240
15	Pride of the North	"	96 to 118		Late milk	21	20
16	Selected Leaming	"	112 to 124	Leafy	"	20	40
17	North Dakota White	"	90 to 102	"	"	20	40
18	Compton's Early	"	84 to 96	"	Glazed	19	500
19	Early Butler	"	90 to 102	Fairly leafy.	"	19	280
20	Pearce's Prolific	"	87 to 100	Leafy	"	18	1,400
21	King of the Earliest	"	84 to 96	"	"	18	850
22	Sanford	"	84 to 96	"	"	17	1,910
23	Evergreen Sugar	"	84 to 96	Fairly leafy.	Late milk	17	1,200
24	Extra Early Huron	"	84 to 96	Leafy	Glazed	17	100
25	Early Giant	Medium	68 to 80	"	"	15	1,900
26	Early Yellow Long-eared	"	72 to 84	"	Doughy	13	1,280
27	Kendall's Giant	"	60 to 72	Fairly leafy.	Glazed	13	180
28	Country Gentleman	"	80 to 90	"	Late milk	12	1,520
29	Mitchell's Extra Early	"	60 to 72	"	Ripe	12	310
30	Yellow Six Weeks Extra	"	60 to 72	"	"	11	110
31	Extra Early Szekley	"	68 to 80	"	"	10	1,780
32	Yellow Dakota Flint	"	60 to 72	"	"	10	1,780
33	Salzer's Earliest Ripe	"	60 to 72	"	"	9	1,800
34	Extra Early Corey	Weak	55 to 67	"	"	9	1,580

INDIAN CORN PLANTED AT DIFFERENT DISTANCES.

Three varieties of Indian corn were chosen for this test, the Longfellow, Selected Leaming and Champion White Pearl. They were sown in rows, at four different dis-

tances, viz., 21, 28, 35 and 42 inches apart. The soil was a sandy loam of fair quality; the previous crop was barley. The land was gang-ploughed shortly after harvest, very shallow, to start weed seeds and shed grain, and ploughed again later in the autumn, about seven inches deep. During the winter of 1899-1900, this land received a dressing of barn-yard manure, fresh from the barn-yard, which was distributed over the land in small piles of about one-third of a cart-load each. In the spring of 1900, the manure was spread and ploughed under about six inches deep, and the land harrowed twice before sowing. The corn was sown with the seed-drill on May 25, and cut for ensilage on September 12. Four rows were sown in each case, and the yield per acre has been estimated from the weight obtained from the two inside rows, 66 feet long.

Name of Variety.	Width of Row.	Character of Growth.	Height when Cut.	Condition when Cut.	Weight per Acre.	
	Inches.		Inches.		Tons.	Lbs.
Selected Leaming	21	Strong	74 to 84	Early milk	30	536
"	28	"	74 " 84	"	27	1,836
"	35	"	80 " 90	Late milk	21	1,780
"	42	Very strong	80 " 90	"	19	496
Longfellow	21	Strong	80 " 92	Early milk	18	1,600
"	28	"	80 " 92	"	18	1,929
"	35	"	84 " 96	Late milk	22	1,100
"	42	Very strong	80 " 94	"	18	1.784
Champion White Pearl	21	Strong	108 " 120	Early milk	19	1,480
" "	28	"	108 " 120	"	20	1,018
" "	35	"	112 " 124	Late milk	23	200
" "	42	Very strong	112 " 124	"	21	48

EXPERIMENTS WITH TURNIPS.

Twenty-seven varieties of turnips were on trial during the past season, all sown side by side on similar land. The soil was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was experimental plots of wheat and barley. During the winter of 1899 and 1900 this land received a dressing of about 12 tons of fresh barn-yard manure per acre, which was placed on the frozen ground in small piles of about a third of a cart-load each to prevent fermentation. This was spread in the spring, ploughed under about six inches deep, harrowed with the smoothing harrow, and cultivated before sowing. The land was then made up in drills two feet apart, and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. The seed was sown at the rate of three pounds per acre. Two sowings were made of each sort, the first on May 16, the second on May 30. They were also pulled on two different dates. The first pulling was on October 16 and the second on November 6. The yield per acre has been calculated from the weight of roots gathered from one row 66 feet in length.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling, October 16.		Yield per Acre from 2nd Sowing, 1st Pulling, October 16.		Yield per Acre from 1st Sowing, 2nd Pulling, November 6.		Yield per Acre from 2nd Sowing, 2nd Pulling, November 6.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Carter's Elephant	42	1,800	25	1,150	45	1,080	29	410
2	Skirvings	37	1,240	31	865	39	210	32	680
3	Champion Purple Top	36	1,590	26	925	35	1,445	26	635
4	West Norfolk Red Top	36	930	29	1,400	37	1,570	30	1,545
5	Sutton's Champion	36	105	34	1,300	36	1,920	34	805
6	Monarch	35	1,940	18	795	39	1,530	23	1,520
7	Magnum Bonum	35	1,280	30	1,710	33	1,320	36	270
8	Drummond Purple Top	35	620	24	1,830	41	1,160	29	740
9	Shamrock Purple Top	33	825	31	37	34	310	29	1,730
10	Turnip seed from Whitman Butler, Kelly's Cove, N.S.	33	660	34	310				
11	Perfection Swede	33	825	28	925	37	580	28	1,750
12	Kangaroo	33	330	29	575	33	1,980	32	845
13	Elephant's Master	32	1,835	30	1,050	30	720	29	905
14	Purple Top Swede	32	1,340	28	760	33	1,320	30	390
15	Hall's Westbury	32	1,010	23	530	38	65	32	350
16	Champion Purple Top	32	680	30	1,050	33	1,485	32	185
17	East Lothian	32	350	21	240	35	620	29	80
18	Hartley's Bronze Top	31	1,360	24	1,170	34	970	32	20
19	Mammoth Clyde	31	1,195	26	1,790	36	1,920	24	510
20	New Arctic	31	1,030	24	180	35	620	25	1,315
21	Marquis of Lorne	31	1,030	26	965	32	1,340	27	285
22	Jumbo	31	370	27	1,935	34	970	28	595
23	Webb's Imperial	30	390	26	1,130	35	1,610	27	1,440
24	Prize Winner	29	80	22	1,375	31	1,855	24	840
25	Prize Purple Top	28	1,750	23	860	28	430	26	800
26	Halewood's Bronze Top	28	100	14	1,370	33	1,650	23	530
27	Bangholm Selected	27	1,440	24	510	39	1,860	29	410
28	Giant King	24	180	21	900	31	370	17	1,310

	Tons.	Lbs.
The average of the 1st sowing, 1st pulling was	32	1,541
" 2nd " "	26	430
" 1st " 2nd "	35	1,219
" 2nd " "	28	1,218

INCREASE IN CROP OF TURNIPS FROM EARLY SOWING ALSO FROM LATE PULLING.

The results here given emphasize the advantages of early sowing. The average yield of turnips from all the varieties from the first sowing and first pulling has exceeded those of the second sowing by 6 tons 1,111 pounds, and in the case of the second pulling made twenty-one days later the larger weight from the earlier sowing is well maintained, the difference being 7 tons 1 pound per acre in favour of early sowing.

The figures given also show that the 21 days of additional time given to the roots to grow between October 16 and November 6 resulted in an average increase in weight in the early sown plots of 2 tons 1,678 pounds per acre, while those later sown increased in weight during the same period 2 tons 788 pounds per acre.

Two acres were sown to fill up the block on the experimental grounds. The soil was clay loam of good quality. The previous crop was experimental plots, wheat, oats, barley. This land received the same fertilizing and treatment as that on which the test of varieties was made. It was cultivated several times in the spring on very sunny days to kill some scutch grass before sowing, it was then made into drills 2 feet apart, and subsequently rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. The variety chosen was Skirvings, the seed was sown at the rate of 3 pounds per acre on June 16 came up June 21, and the roots were pulled November 6. Yield per acre, 25 tons 1,275 pounds, or 854 bushels 35 pounds.

EXPERIMENTS WITH MANGELS.

The number of varieties of mangels under test in 1900 was twenty-two. These were all sown side by side adjoining the turnips ; the land was similar in character and its treatment and preparation was the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made of each sort, the first on May 16, the second on May 30. They were also pulled on two different dates, the first pulling was on October 16 and the second on November 6. The yield per acre has been calculated from the weight of roots gathered from one row, 66 feet in length.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing, 1st Pulling October 16.		Yield per acre from 2nd Sowing, 1st Pulling October 16.		Yield per acre from 1st Sowing, 2nd Pulling November 6.		Yield per acre from 2nd Sowing, 2nd Pulling November 6.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Canadian Giant	51	630	34	310	51	1,620	34	1,465
2	Giant Yellow Intermediate	49	340	24	1,500	49	835	27	1,770
3	Ward's Large Oval Shaped	47	1,040	33	1,650	46	1,720	35	620
4	Mammoth Long Red	46	400	39	540	40	685	40	520
5	Giant Yellow Half Long	45	1,080	25	1,150	40	1,923	31	1,360
6	Yellow Intermediate	44	440	38	560	45	750	39	870
7	Gate Post	42	480	34	1,300	41	253	33	1,320
8	Half Long Sugar Rosy	42	295	28	430	43	1,120	38	890
9	Champion Yellow Globe	42	150	35	290	43	130	35	1,280
10	Yellow Intermediate	42	150	40	1,510	42	1,470	41	1,160
11	Half Long Sugar White	41	1,820	31	700	33	1,320	39	1,860
12	Prize Mammoth Long Red	41	1,490	33	990	42	150	33	1,650
13	Lion Yellow Intermediate	41	500	40	1,180	40	685	39	1,200
14	Gate Post Yellow	41	500	29	1,400	39	870	30	1,215
15	Giant Yellow Globe	41	170	27	450	41	830	30	1,050
16	Yellow Globe	41	170	37	580	40	1,345	40	1,840
17	Mammoth Oval Shaped	39	210	41	500	41	5	38	1,880
18	Norbitan Giant	37	910	31	1,360	38	1,220	32	1,670
19	Selected Mammoth Long Red	37	250	30	1,050	39	1,860	31	370
20	Golden Fleshed Tankard	36	1,590	31	1,855	37	580	32	680
21	Yellow Fleshed Tankard	31	865	30	60	33	330	31	1,690
22	Warden Orange Globe	31	370	30	60	35	455	31	535

	Tons.	Lbs.
Average of 1st sowing, 1st pulling	41	1,084
" 2nd " 1st "	41	553
" 1st " 2nd "	33	338
" 2nd " 2nd "	35	223

SUMMARY.

In 1898 there was a considerable increase in the crop of mangels from the early sown plots; this year only a small advantage was gained by early sowing. The average of the crops from the first sowing was only 531 pounds per acre above that from the second sowing. At the same time there was a falling off in both instances in the second pulling, probably the result of unfavorable conditions of weather.

EXPERIMENTS WITH CARROTS.

Nineteen varieties of carrots were under test during 1900, all sown side by side adjoining the turnips and mangels. The land was similar in character and its treatment and preparation were the same. The land was made up in drills two feet apart, and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made of each sort, the first on May 16, the second on May 30. They were also pulled on two different dates; the first pulling was on October 16, the second on November 6. The yield per acre has been calculated from the weight of roots gathered from one row 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing, 1st Pulling October 16.		Yield per acre from 2nd Sowing, 1st Pulling October 16.		Yield per acre from 1st Sowing, 2nd Pulling November 6.		Yield per acre from 2nd Sowing, 2nd Pulling November 6.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	White Vosges Large Short	38	1,880	27	1,770	39	870	27	1,110
2	New White Intermediate	37	250	31	1,810	35	950	33	330
3	Improved Short White	35	1,280	27	120	41	170	28	1,915
4	Half Long White	33	1,155	27	1,275	37	580	33	1,980
5	Iverson's Champion	32	1,340	26	1,130	37	910	30	1,380
6	Green Top White Orthe	32	915	26	470	33	1,650	26	965
7	Giant White Vosges	31	700	25	1,150	31	1,030	27	450
8	Guerande or Ox-Heart	27	615	23	1,190	30	1,380	29	1,730
9	Yellow Intermediate	26	1,460	24	1,170	27	1,770	27	120
10	Ontario Champion	26	800	24	15	32	515	29	1,730
11	Mammoth White Intermediate	26	140	22	550	35	620	23	1,850
12	Carter's Orange Giant	25	1,810	21	1,560	27	120	24	1,170
13	Half Long Chantenay	25	985	24	1,170	27	615	23	695
14	Early Gem	25	820	22	550	35	290	25	1,480
15	White Belgian	22	880	21	570	22	1,540	22	220
16	Scarlet Intermediate	19	1,270	15	1,185	21	1,230	19	1,930
17	Scarlet Nantes	17	1,805	15	690	18	360	16	1,990
18	Long Orange or Surrey	17	1,805	14	50	21	1,560	17	650
19	Long Scarlet Altringham	17	650	12	1,080	20	590	15	360

	Tons.	Lbs.
Average of 1st sowing, 1st pulling	27	766
" 2nd " 1st "	22	1,763
" 1st " 2nd "	30	668
" 2nd " 2nd "	25	950

INCREASE IN CROP OF CARROTS FROM EARLY SOWING, ALSO FROM LATE PULLING.

With carrots early sowing has been attended with much advantage. The average yield from all the varieties from the first sowing and first pulling was four tons 1,003 pounds more than was harvested from the second sowing.

During the 21 days between the dates of the first and second pullings, the early sown plots gained on an average 2 tons 1,902 pounds per acre, while the roots from the second sowing during the same time made a gain of 2 tons 1,187 pounds per acre.

EXPERIMENTS WITH SUGAR BEETS.

Six varieties of sugar beets were tested in 1900. They were sown side by side on land adjoining that used for the trial plots of turnips, mangels and carrots ; the soil was similar and the treatment and preparation of the land and the method of sowing were the same. Two sowings were made, the first on May 16, the second on May 30. They were also pulled at two different dates ; the first pulling was on October 16, the second on November 6. The yield per acre has been calculated from the weight of roots gathered from one row 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing, 1st Pulling October 16.		Yield per Acre from 2nd Sowing, 1st Pulling October 16.		Yield per Acre from 1st Sowing, 2nd Pulling November 6.		Yield per Acre from 2nd Sowing, 2nd Pulling November 6.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Danish Improved	42	810	28	430	35	1,280	35	1,940
2	Wanzleben	40	355	31	1,030	40	520	35	455
3	Improved Imperial	38	1,335	25	490	32	1,340	33	330
4	Red Top Sugar	37	580	26	1,130	36	1,260	31	700
5	Danish Red Top	34	805	31	1,030	35	620	39	1,200
6	Vilmorin's Improved	27	615	22	220	27	1,110	25	1,150

	Tons.	Lbs.
Average of 1st sowing, 1st pulling	36	1,417
" 2nd " 1st "	27	1,055
" 1st " 2nd "	34	1,355
" 2nd " 2nd "	33	963

The increase in crop from the early sowing of sugar beets was very marked this year, the gain amounting to 9 tons 362 pounds per acre. There was a slight decrease in the crop in the second pulling of the early sown plots, but on those later sown the increase was 5 tons 1,908 pounds per acre.

FIELD PLOTS OF POTATOES.

The following field plots of potatoes were included in the land devoted to experimental purposes. The land on which these potatoes were planted was similar throughout, and the preparation and treatment were the same for all. The soil was a light sandy loam. The previous crop was pease. During the winter of 1899 and 1900 it received a dressing of about 12 tons of fresh barn-yard manure per acre, which was placed during the winter on the frozen ground in small piles of about a third of a cart-load each, to prevent fermentation. This was spread in the spring, ploughed under about six inches deep, and harrowed with the smoothing-harrow, then made into drills 2½ feet apart and six inches deep for planting.

No.	Name of Variety.	When Planted.		Came up.		When Dug.		Yield per Acre.	
								Bush.	Lbs.
1	Carmans No. 1	May	23	June	12	Sept.	27	387	44
2	Early Sunrise	"	25	"	12	"	28	257	30
3	Burnaby Seedling	"	25	"	12	"	29	228	43
4	Early Harvest	"	25	"	12	October	1	327	1
5	*Empire State	"	25	"	12	"	1	226	15
6	†American Wonder	"	25	"	12	"	2	165	47
7	*Everett	"	25	"	12	"	2	221	10
8	Wonder of the World	June	1	"	17	"	3	333	16
9	Early Rose	"	1	"	17	"	3	291	47
10	Seedling 230	"	1	"	17	"	3	428	41
11	Prize Taker	May	28	"	15	"	3	290	24
12	Uncle Sam	"	28	"	15	"	3	313	33
13	Early White Prize	"	28	"	15	"	3	351	34

* Part in low land. † Wet low land lessened the yield.

Number	Name of Variety.	When Planted.	Came Up.	When Dug.	Yield Per Acre.
1	Sir Walter Raleigh	May 28	June 15	Oct. 3	325·33
2	Vigorosa	" 28	" 15	" 3	318·25
3	New Queen	" 28	" 15	" 3	316 53
4	Honeoye Rose	" 28	" 15	" 3	272·34
5	Canadian Beauty	" 28	" 15	" 3	453·26
6	Early Andes	" 28	" 15	" 3	384·39
7	Prolific Rose	" 28	" 15	" 3	351·32
8	Bovee	" 28	" 15	" 3	360·42
9	Rochester Rose	" 28	" 15	" 3	255·53

EXPERIMENTS WITH SUNFLOWERS.

A plot covering a quarter of an acre was sown with this crop. The soil was a sandy loam of good quality. The previous crop was oats. After the oat crop was cut the land was gang-ploughed shallow, and later in the autumn it was ploughed to the depth of 7 or 8 inches. During the winter of 1899 and 1900 the land received a dressing of fresh barn-yard manure, about 12 tons per acre. This was placed on the frozen ground in small piles of about one-third cart-load each to prevent fermentation and loss, and spread and ploughed under in the spring of 1900. The land was then harrowed twice with the disc-harrow and three times with the smoothing-harrow, when the seed was sown with the grain drill in rows 3 feet apart, about 3 or 4 pounds of seed being used per acre. Subsequently the plants were thinned out when they were 4 or 5 inches high, so as to leave them from 12 to 15 inches apart in the rows.

The variety tried was Mammoth Russian, black seed. It was sown on May 25, and the heads were cut on September 15 and put in the silo. The plants made a strong growth, and the heads were ripe when cut.

Yield of heads per acre was 6 tons 1,920 pounds.

This crop should have been sown earlier. In our experience, sunflowers cannot be sown too early; the earlier the seed is got in the larger the crop, provided the season is favourable.

EXPERIMENTS WITH SOJA BEANS.

(Soja hispida.)

Three plots of one-fortieth acre each were sown in rows, at different distances, viz.: 21, 28 and 35 inches apart, to gain information as to the best distance for sowing to secure the heaviest crops. The soil was a sandy loam of good quality. The previous crop was corn. After the corn was cut the land was ridged up with a double mould-board plough and left in ridges until the spring of 1900. The ridges were two feet and a half apart. This land received a dressing of barn-yard manure, about 12 tons per acre, during the winter of 1898 and 1899. In the spring of 1900 the ground was cultivated twice with a two-horse cultivator and twice with smoothing harrow. The beans were sown with a seed drill on May 22, and cut on September 13.

Plot 1.—Sown in rows 21 inches apart; growth strong and even, leafy; average height 40 to 44 inches. The pods were well formed, but the beans were soft when the crop was cut. Yield of green fodder, 10 tons 80 pounds per acre.

Plot 2.—Sown in rows 28 inches apart; growth strong and even, very leafy. Average height 40 to 44 inches. The pods were well formed, the beans were full grown and beginning to harden at time of cutting. Yield of green fodder, 12 tons 400 pounds per acre.

Plot 3.—Sown in rows 35 inches apart; growth strong and even, leafy, stems hard and woody. Average height 40 to 44 inches. The plants were better podded than those in plots 1 or 2, and the beans were harder when cut, but the plant was less valuable for fodder. Yield of green fodder, 10 tons 520 pounds per acre.

EXPERIMENTS WITH HORSE BEANS.

(Faba vulgaris var. equina.)

Three plots of one-fortieth acre each were sown in rows 21, 28 and 35 inches apart, to gain information as to the best distance for sowing to secure the heaviest crops. The land was adjoining that used for Soja beans, was similar in quality and received the same treatment. The previous crop was corn. The beans were sown with the seed drill; all the plots were sown on May 22 and cut September 13. The plants were free from blight.

Plot 1.—Sown in rows 21 inches apart. Growth strong, well podded. Height 42 to 46 inches, considerably lodged. The beans were nearly ripe when cut. Total yield, 9 tons 200 pounds per acre.

Plot 2.—Sown in rows 28 inches apart. Growth strong and well podded. Height 45 to 49 inches. Plot all standing, stalks considerably stiffer than in plot No. 1. The beans were nearly ripe when cut. Total yield, 8 tons 1,680 pounds per acre.

Plot 3.—Sown in rows 35 inches apart. Growth strong, well podded. Height 45 to 49 inches. Plot all standing, stalks stiff. The beans were nearly ripe when cut. Total yield, 9 tons 1,760 pounds per acre.

EXPERIMENTS WITH MILLETS.

Seven varieties were sown on plots of one-fortieth acre each. All were sown in drills 7 inches apart. The soil was a sandy loam. The previous crop was corn. The land receiving a dressing of barn-yard manure during the winter of 1898 and 1899. After the corn was cut the land was drilled up in ridges 2½ feet apart with a double mould-board plough, and left in that state until the spring of 1900, when it was cultivated twice with a two-horse cultivator and twice with a smoothing harrow before sowing. The seed was sown with a Planet Junior seed drill, and all the varieties were sown on May 23. The plots suffered from continued wet weather, and made very slow growth. These were all cut when the seed was in the doughy stage.

Number.	Name of Variety.	Date Cut.	Length of Straw.	Character of Growth	Weight Per Acre Green.		Weight Per Acre Dry.	
			Inches.		Tons	Lbs.	Tons	Lbs.
1	Italian or Indian	Sept. 12	56—60	Strong	7	1500	4	160
2	Golden	" 22	50—55	"	7	400	4	1680
3	Japanese	" 10	40—45	Medium	6	1800	4	1978
4	Algerian	" 13	50—55	Strong	5	800	3	1206
5	White Round French	Aug. 22	40—45	Medium	5	226	3	680
6	Moha Hungarian	" 22	40—45	"	5	101	3	1200
7	Pearl, late or Cat-tail	Sept. 22	30—40	"	4	1600	3	201

ORNAMENTAL TREES AND SHRUBS.

The ornamental trees and shrubs on the lawns and along the margins of the roads leading to the buildings are making rapid growth, and among them are many individual specimens of great beauty. The number of species and varieties now growing in the various clumps and groups on this part of the Experimental Farm is about 500, and includes many rare species as well as most of the more common and well-known sorts. The succession of bloom in the flowering shrubs and the many changing tints of colour shown on the foliage of both evergreen and deciduous species as the season progresses, combine to make the shrubbery borders a source of pleasure to all who see them. In plate 1 a view is presented of the planting of a part of the main road leading to the office building.

DISTRIBUTION OF SEED GRAIN TO FARMERS FOR TRIAL.

Another distribution of seed grain was made in the spring of 1900, consisting of samples of the most promising sorts of oats, spring wheat, barley, pease, Indian corn and potatoes. The object in view in these annual distributions is to place within reach of farmers, for the improvement of seed, pure samples of the best and most productive varieties in cultivation. By the careful growing of one of these samples of grain the product will soon be sufficient to sow a large area, and thus in a short time the farmer can provide himself with some of the best sorts without cost, beyond that of his own labour. The appreciation in which this part of the work is held is evidenced by the very large demand each year for such samples.

The samples sent out from the Central Experimental Farm during the early months of 1900 were distributed as follows:—

Number.	Kind of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
1	Oats	605	1,128	951	1,519	2,478	1,094	608	122
2	Barley	131	501	215	509	651	295	152	41
3	Wheat	295	736	958	1,581	932	604	300	53
4	Pease	41	536	476	446	840	546	322	66
5	Indian Corn	28	284	217	345	905	122	44	26
6	Potatoes	112	730	849	779	2,392	882	425	179
	Total	1,212	3,915	3,666	5,179	8,198	3,543	1,851	487

Total number of samples distributed 28,082
Number of applicants supplied 28,051

The following list shows the number of 3-pound packages of the different varieties which have been sent out :—

Name of Variety.	Number of Packages.
OATS.	
Improved Ligowo..........................	2,263
Banner	1,105
Siberian..................................	914
Golden Beauty............................	773
Wide Awake..............................	590
Abundance................................	589
Bavarian..................................	588
American Beauty......	508
Holstein Prolific.........................	369
Prolific Black Tartarian.........	297
Wallis	272
Golden Giant.............................	139
Bonanza..................................	100
White Schonen..........	67
Joanette	23
Total	8,597
BARLEY.	
Six-rowed.	
Mensury	817
Royal.....................................	398
Odessa...................................	371
Oderbruch...............................	256
Trooper.	52
Two-rowed.	
Canadian Thorpe.	305
French Chevalier.......................	216
Sidney.........	49
	2,464
SPRING WHEAT.	
Preston	1,257
Red Fife.	927
Percy.	629
White Connell...........................	602
Wellman's Fife..........................	587
White Fife..	478
Stanley	351
White Russian	269
Hungarian...............................	228
Monarch..................................	81

Name of Variety.	Number of Packages.
SPRING WHEAT—*Concluded.*	
Dufferin...........	56
Total..........	5,465
PEASE.	
Canadian Beauty....................	1,353
Large White Marrowfat....	950
Prussian Blue..........	693
Black Eyed Marrowfat.............	195
Total....................	3,191
INDIAN CORN.	
Selected Leaming.......	941
Longfellow.......	502
Angel of Midnight..................	157
White Cap Yellow Dent............	135
Early Butler.........................	103
Compton's Early......	47
Champion White Pearl..............	39
Sanford................................	30
Pearce's Prolific.	8
Total..	1,962
POTATOES.	
American Wonder.....	787
Daisy	749
Carman's No. 1..........	643
Dakota Red	602
Wonder of the World...............	485
Clarke's No. 1....	415
Early Sunrise..	389
Rochester Rose.......................	367
Everett	309
Early Harvest	280
Lee's Favourite......................	279
Henderson's Late Puritan.	263
I.X.L...............	249
Vanier..................................	170
Empire State.........	154
Early Rose......	138
Burnaby Seedling....	124
Total...................	6,403

Total number of packages distributed—

Wheat	5,465
Oats	8,597
Barley	2,464
Pease.......	3,191
Corn....................	1,962
Potatoes...............	6,403
Total number of samples sent out during the season....	28,082

DISTRIBUTION OF SAMPLES OF GRAIN SUFFICIENT FOR ONE-TENTH OF AN ACRE.

The distribution of grain in larger samples sufficient for one-tenth acre plots begun in 1899 was continued in 1900. These samples were sent to a special but limited list of farmers selected from among those who have shown a special interest in this important work. In preparing the list for this purpose, the names have been chosen from every part of the Dominion, and every agricultural constituency has been represented.

These special samples, to the number of 3,127, have been distributed by provinces as follows:—

Name of Grain.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	N.W.T.	B.C.
Oats	51	163	173	451	491	73	57	26
Spring wheat	50	84	155	361	249	49	38	16
Barley	31	75	50	218	199	39	25	3
Total	132	322	378	1,030	939	161	120	45

The following list shows the number of these larger packages of the different varieties which have been sent out:—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		WHEAT—*Continued.*	
Abundance	401	Percy	131
Improved Ligowo	390	Advance	107
American Beauty	260		
Banner	227	Total	977
Golden Giant	148		
Bavarian	78	BARLEY.	
Total	1,504	Royal	303
		Trooper	146
WHEAT.		Beaver	128
		Sidney	69
Preston	378		
Wellman's Fife	228	Total.	646
Stanley	133		

Oats	1,504
Wheat	977
Barley	646
Total	3,127

TESTS OF THE VITALITY OF GRAIN AND OTHER SEEDS DURING 1900.

During the early months of the season of 1900, the number of samples of seed grain and other seeds tested for their vitality was 2,098. These were sent in chiefly by farmers and came from many different parts of Canada. This work is carried on from year to year to give to farmers the opportunity of having any doubtful samples tested. By this means any injury to the vitality of grain from unfavourable weather during harvest may be promptly detected and the extent of the injury ascertained. Samples may be sent to the Central Experimental Farm, free, through the mail, and the quantity necessary for the test is about one ounce. The samples are tested and reported on free of charge, and their percentage of vitality can usually be determined within two weeks after they are received.

RESULTS of Tests of Seeds for Vitality, 1899–1900.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
Wheat	534	100·0	21·0	83·2	4·7	87·8
Barley	465	100·0	22·0	75·8	8·3	84·2
Oats	595	100·0	11·0	89·8	4·8	94·7
Rye	1	88·0	88·0	78·0	10·0	88·0
Pease	94	100·0	72·0	....	....	94·9
Corn	10	100·0	88·0	....	....	94·8
Grass	13	88·0	16·0	....	....	55·8
Clover	5	82·0	0·0	....	....	48·2
Turnips	20	89·0	20·0	....	....	67·2
Mangels	18	90·0	22·0	....	....	63·2
Carrots	14	62·0	7·0	....	....	40·0
Cabbage	33	96·0	6·0	....	....	58·4
Tomatoes	21	100·0	7·0	....	....	59·8
Radish	22	100·0	38·0	....	....	68·2
Lettuce	23	96·0	1.0	....	....	41·8
Spinach	8	39·0	9·0	....	....	27·0
Onions	24	84·0	1·0	....	....	46·6
Beets	17	96·0	32·0	....	....	71·6
Celery	19	87·0	3·0	....	....	50·1
Cauliflower	8	95·0	40·0	....	....	73·2
Brocoli	3	44·0	7·0	....	....	31·3
Savoy Cabbage	2	86·0	73·0	....	....	79·5
Pumpkins	4	20·0	0·0	....	....	12·5
Squash	16	80·0	0·0	....	....	18·7
Water Melon	13	75·0	0·0	....	....	14·2
Musk Melon	16	48·0	0·0	....	....	12·8
Cucumber	10	92·0	0·0	....	....	30·4
Citron	3	80·0	5·0	....	....	31·6
Sweet Peas	16	100·0	0·0	....	....	54·6
Flax	4	75·0	2·0	....	....	46·7
Mustard	4	88·0	76·0	....	....	80·2
Cress	3	78·0	2·0	....	....	50·3
Tobacco	9	85·0	26·0	....	....	58·1
Leeks	3	64·0	55·0	....	....	58·0
Salsify	3	85·0	4·0	....	....	40·6
Parsnips	3	45·0	38·0	....	....	41·0
Nasturtium	2	50·0	20·0	....	....	35·0
Chicory	3	75·0	67·0	....	....	71·0
Sweet Marjoram	4	52·0	19·0	....	....	28·5
Summer Savory	2	52·0	18·0	....	....	35·0
Sage	2	63·0	30·0	....	....	46·5
Sweet Basil	2	38·0	21·0	....	....	29·5
Carraway Seed	2	75·0	1·0	....	....	38·0
Horehound	2	2·0	0·0	....	....	1·0
Mignonette	2	18·0	13·0	....	....	15·5
Egg Plant	2	21·0	11·0	....	....	16·0
Rape	2	99·0	56·0	....	....	77·5
Tares	1	100·0	100·0	....	....	100·0
Canary Seed	1	57·0	57·0	....	....	57·0
Sunflower	1	100·0	100·0	....	....	100·0
Parsley	4	25·0	3·0	....	....	12·7
Brussel Sprouts	1	76·0	76·0	....	....	76·0
Celeriac	1	47·0	47·0	....	....	47·0
Asparagus	1	30·0	30·0	....	....	30·0
Rhubarb	1	60·0	60·0	....	....	60·0
Endive	1	66·0	66·0	....	....	66·0
Chervil	1	4·0	4.0	....	....	4·0
Anise	1	5·0	5·0	....	....	5·0
Rue	1	8·0	8·0	....	....	8·0
Thyme	1	4·0	4.0	....	....	4·0
Ampelopsis	1	5·0	5·0	....	....	5·0
Total number of samples tested, highest and lowest percentage.	2,098	100·0	0·0	....	....	....

(Signed) W. T. ELLIS.

TABLE showing Results of Grain Tests for each Province.

Kind of Seed.	Number of Tests.	Highest Per-centage.	Lowest Per-centage.	Per-centage of Strong Growth.	Per-centage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	130	100·0	45·0	69·4	6·8	76·3
Barley	101	100·0	60·0	83·4	9·1	92·5
Oats	139	100·0	59·0	90·6	6·8	97·4
QUEBEC.						
Wheat	52	100·0	86·0	92·3	2·8	95·1
Barley	88	100·0	64·0	85·7	8·2	94·0
Oats	51	100·0	60·0	91·0	3·2	94·2
MANITOBA.						
Wheat	117	100·0	21·0	86·8	3·7	90·6
Barley	70	100·0	22·0	87·5	6·3	93·8
Oats	135	100·0	80·0	91·8	4·0	95·9
NORTH WEST TERRITORIES.						
Wheat	109	100·0	43·0	87·1	3·9	91·1
Barley	71	100·0	75·0	90·4	4·7	95·2
Oats	112	100·0	11·0	86·3	5·5	91·8
NOVA SCOTIA.						
Wheat	25	99·0	65·0	85·1	3·8	89·0
Barley	71	100·0	69·0	72·2	16·7	89·0
Oats	25	100·0	68·0	88·2	3·5	91·8
NEW BRUNSWICK.						
Wheat	26	100·0	77·0	90·2	3·4	93·6
Barley	40	100·0	65·0	80·3	10·7	91·1
Oats	25	100·0	88·0	92·2	3·5	95·8
PRINCE EDWARD ISLAND.						
Wheat	67	100·0	63·0	86·0	4·9	91·0
Barley	22	100·0	64·0	80·7	10·5	91·2
Oats	95	100·0	66·0	88·7	4·3	93·1
BRITISH COLUMBIA.						
Wheat	8	99·0	68·0	88·2	1·6	89·8
Barley	2	97·0	97·0	95·5	1·5	97·0
Oats	13	99·0	89.0	92·0	2·4	94·5

EFFECT OF THE PLOUGHING UNDER OF GREEN CLOVER AS A FERTILIZER FOR OATS.

In the spring of 1899, six plots of one-fortieth acre each were sown with grain. Two of these plots were sown with Preston wheat, two with Mensury barley, and two with Banner oats. One of these plots in each case had clover sown with the grain at the rate of 12 pounds per acre; the other had no clover. The soil was a sandy loam of fairly good quality, and up to this time the land had ben used as a nursery. After the grain crop had been taken off, the clover was allowed to grow until late in the autumn, when it was ploughed under to the depth of 6 or 7 inches. In the spring of 1900 the land was harrowed twice with a disc-harrow and twice with a smoothing harrow, and sown with one kind of oats, viz., New Zealand, at the rate of 2 bushels of seed per acre. The oats were sown on May 4.

No. of Plot.	Variety.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield of Oats per Acre in 1900.	Rusted.
	New Zealand Oats Sown After.	Inches.		Inches.		Bush. Lbs.	
1	Preston wheat, 1899, with clover...	48–52	Stiff	9–10½	Sided.....	53 18	Slightly.
2	Preston wheat, 1899, no clover.....	44–48	"	9–10	"	51 26	"
3	Mensury barley, 1899, with clover..	48–54	"	9–11	"	58 28	"
4	Mensury barley, 1899, no clover...	45–50	"	9–10	"	56 16	"
5	Banner Oats, 1899, with clover ...	48–54	"	9–11	"	58 28	"
6	Banner oats, 1899, no clover......	46–50	"	9–10½	"	56 16	"

The advantage arising from the sowings of clover with spring grain recorded above are quite evident but would no doubt have made much more difference but for the fact that the clover was sown late in the spring of 1899 and hence the growth for ploughing under was comparatively short and unsatisfactory.

EFFECT OF THE PLOUGHING UNDER OF GREEN CLOVER AS A FERTILIZER FOR INDIAN CORN.

In the spring of 1899, six plots, one-fortieth acre each, were sown with grain. Two of these plots were sown with Preston wheat, two with Mensury barley, and two with Banner oats. One plot in each case had clover sown with the grain at the rate of 12 pounds per acre; the other had no clover. The soil was a sandy loam of fairly good quality, and up to this time the land had been used as a nursery. After the grain was cut, the land was left untouched until the following spring, by which time the clover had made a good growth, when it was ploughed under to the depth of 6 or 7 inches. The land was then harrowed twice with a disc-harrow and twice with a smoothing harrow. The corn was sown with the seed-drill, on May 25, in rows three feet apart and cut for ensilage on September 13. The variety used for this test was Longfellow.

No. of Plot.	Variety.	Height.	Leafiness.	Late Milk.	Condition when cut.	Weight per acre grown in rows.	
	Longfellow Corn Sown After.	Inches.				Tons.	Lbs.
1	Oats Banner, 1899, no clover......	80—90	Leafy	Late milk.....	Late milk.....	14	1800
2	Oats Banner, 1899, with clover.....	84—96	"	"	"	18	1720
3	Barley Mensury, 1899, no clover...	84—94	"	"	"	16	1440
4	Barley Mensury, 1899, with clover.	86—96	"	"	"	17	1120
5	Wheat Preston, 1899, no clover....	84—94	"	"	"	16	1160
6	Wheat Preston, 1899, with clover..	86—98	"	"	"	19	1560

While the effect as shown by the figures given has been very decided, the clover was sown in this instance also, too late for the best results to be obtained.

INCREASE IN THE YIELD OF POTATOES BY THE PLOUGHING UNDER OF GREEN CLOVER.

In the spring of 1899, six plots of one-fortieth acre each were sown with grain, two with Preston wheat, two with Mensury barley and two with Banner oats. One plot in each case had clover sown with the grain, at the rate of 12 pounds per acre, the other had no clover. The soil was a sandy loam. In the spring of 1900, the clover was ploughed under, and the plots were all planted with one variety of potatoes, Rochester Rose. These were planted on May 28, came up June 15, and were dug October 5, with the following results :—

	Yield per acre. Bus.	Lbs.
Plot No. 1, on which Preston wheat was sown in 1899, without clover......	280	40
Plot No. 2, on which Preston wheat was sown in 1899, with clover......	320	..
Plot No. 3, on which Banner oats was sown, without clover..	290	40
Plot No. 4, on which Banner oats was sown, with clover....	301	20
Plot No. 5, on which Mensury barley was sown, without clover.	280	..
Plot No. 6, on which Mensury barley was sown, with clover..	330	..

EFFECTS OF FERTILIZERS ON SPRING WHEAT AND OATS.

During the past season two series each, consisting of sixteen one-eightieth acre plots, have been laid out, twelve of which in each set have been treated with different fertilizers, and the remaining four left as check plots, receiving no fertilizers. One set of these plots has been sown with spring wheat of the variety known as Preston, the other with Ligowo oats.

The object in view in this test is to watch the effects on land in a fair average condition of fertility, of barn-yard manure fresh and rotted, fresh slaked lime, nitrate

of soda, superphosphate and Thomas' Phosphate, all used singly. Also, of superphosphate with kainit and with kainit and nitrate of soda, and of Thomas' Phosphate with kainit, and also with kainit and nitrate of soda.

The land chosen for this test was in a fairly good condition of tilth. The soil was a sandy loam, which had been under cultivation since 1887, and has been cropped each year since with a suitable rotation of crops, and has received a dressing of barn-yard manure about once in four years. The last application of manure was in 1897, when it received about twelve tons per acre. The land was cropped in 1899 with experimental grain plots, mostly barley.

It is proposed to grow the same crops on this land for a series of years, using the same fertilizers in the same quantities every second year. In this way it is hoped that some further information may be gained as to the effect of these different fertilizers when used singly and in combination on the two important crops named. As this land was in a fair average condition as to fertility, it may be regarded as representing in a general way, average sandy loams on farms properly worked.

RESULTS OF THE APPLICATION OF FERTILIZERS TO SPRING WHEAT.

No. of Plot.	Name of Variety.	Date of Sowing.	Date of Ripening.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	Rusted.
				Inches.		Inches.		Bush. Lbs.	
1	Superphosphate, 400 lbs. per acre	May 11.	Aug. 16.	40 to 43	Stiff....	3 to 4	Bearded	25·20	Slightly.
2	Thomas' phosphate, 400 lbs. per acre	" 11.	" 16.	40 43	"	3 4	" .	25·20	"
3	Thomas' phosphate, 800 lbs. per acre	" 11.	" 16.	40 43	"	3 4	" .	25·20	"
4	Check	" 11.	" 16.	40 43	"	3 4	" .	26·40	"
5	Thomas' phosphate, 400 lbs. kainit, 200 lbs. per acre	" 11.	" 16.	40 43	"	3 4	"	26·40	"
6	Superphosphate, 400 lbs. kainit, 200 lbs. per acre	" 11.	" 16.	40 43	"	3 4	" .	24·40	"
7	Check	" 11	" 16.	40 43	"	3 4	" .	25·20	"
8	Thomas' phosphate, 400 lbs. kainit, 200 lbs. nitrate soda, 100 lbs. per acre	" 11.	" 16.	40 43	" ...	3 4	" .	26·00	"
9	Superphosphate, 400 lbs. kainit, 200 lbs. nitrate soda, 100 lbs. per acre	" 11.	" 16.	40 43	"	3 4	" .	26·00	"
10	Barn-yard manure, mixed, horse and cow, fresh, 12 tons, per acre	" 11.	" 16.	40 43	"	3 4	" .	24·00	"
11	Barn-yard manure, mixed, horse and cow, well rotted, 12 tons, per acre	" 11.	" 16.	40 43	"	3 4	" .	22·40	"
12	Check	" 11.	" 16.	40 43	"	3 4	" .	21·20	"
13	Fresh slacked lime, 1,000 lbs. per acre	" 11.	" 16.	30 36	"	2½ 3½	....	12·00	"
14	Nitrate soda, 100 lbs. per acre	" 11.	" 16.	32 36	"	3 3½	....	16·00	"
15	Check	" 11.	" 16.	32 36	"	3 3½	....	16·00	"
16	Nitrate soda, 200 lbs. per acre	" 11.	" 16.	32 36	"	3 3½	....	13·20	"

The falling off in yield from plots 13 to 16 inclusive may be attributed partly to the land being lighter and of poorer quality.

RESULTS OF THE APPLICATION OF FERTILIZERS TO OATS.

No. of Plot.	Name of Variety.	Date of Sowing.	Date of Ripening.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Rusted.
				Inches.		Inches.		Bush.	Lbs.	
1	Superphosphate, 400 lbs. per acre........	May 11.	Aug. 16.	45 to 50	Stiff....	8 to 9½	Branching	70	20	Slightly
2	Thomas' phosphate, 400 lbs. per acre..........	" 11.	" 16.	45 50	" ...	8 9½	" ..	72	22	"
3	Thomas' phosphate, 800 lbs. per acre...	" 11.	" 16.	45 50	" ...	8 9½	" ..	72	22	"
4	Check..................	" 11.	" 16.	45 50	" ...	8 9½	" ..	75	10	"
5	Thomas' phosphate, 400 lbs. kainit, 200 lbs. per acre..................	" 11.	" 16.	45 50	" ...	8 9½	" ..	70	20	"
6	Superphosphate, 400 lbs., kainit, 200 lbs. per acre	" 11.	" 16.	45 50	" ...	8 9½	" ..	73	18	"
7	Check.............. . .	" 11.	" 16.	45 50	" ...	8 9½	" ..	73	18	"
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	" 11.	" 16.	45 50	" ...	8 9½	" ..	70	20	"
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre..	" 11.	" 16.	45 50	" ...	8 9½	" ..	68	8	"
10	Barn-yard manure, mixed horse and cow, fresh, 12 tons per acre.....	" 11.	" 16.	45 50	" ...	8 9½	" ..	71	26	"
11	Barn-yard manure, mixed horse and cow, well rotted, 12 tons per acre	" 11.	" 19.	45 50	" ...	8 9½	" ..	72	32	"
12	Check................	" 11.	" 16.	45 50	" ...	8 9½	" ..	72	32	"
13	Fresh slacked lime, 1,000 lbs. per acre..........	" 11.	" 16.	45 50	" ...	8 9½	" ..	68	8	"
14	Nitrate soda, 100 lbs. per acre............	" 11.	" 15.	45 50	" ...	8 9½	" ..	72	32	"
15	Check...........	" 11.	" 16.	45 50	" ...	8 9½	" ..	68	8	"
16	Nitrate soda, 200 lbs. per acre..............	" 11.	" 16.	45 50	" ...	8 9½	" ..	65	30	"

In this series of tests the check plots to which no fertilizers have been applied, have given crops averaging about as large as any of the plots on which fertilizers have been used. This would seem to show that the land this season contained all the available plant food which the crops could utilize. With the partial exhaustion which will be produced by several successive crops the relative usefulness of the different fertilizers will probably be more clearly manifest.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn and five years' experience with crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued; and as explanatory regarding the preparations made and the general plan together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893 :—

'A piece of sandy loam, more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded 6 inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles, on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping.

'The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. It was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn, and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890.' In all cases the plots in each series have been sown on the same day.

'In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also the half of the barley plots cropped with sugar beets that year.' In 1894, 1895, 1896, 1897 and 1898 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

TREATMENT OF SOIL.

'The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again later, about 7 inches deep. In spring the plots have been gang-ploughed once before applying the fertilizers, which are then scattered over the surface and harrowed with the smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and just before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions.'

A summary of these permanent fertilizer plots is given each year, taking the average yield of the whole previous period, adding the results of the current year, and then giving the average yield for the full time.

OBJECTS IN VIEW IN CONDUCTING THESE EXPERIMENTS.

It should be distinctly understood that in establishing and conducting this series of experiments, the object in view has been to gain as much information as possible as to the actual effects of certain fertilizers and combinations of fertilizers on particular crops. These experiments were never intended to serve as model test plots such as farmers could copy to advantage in their general practice. On the contrary, to gain the information desired, it has been found necessary to use some fertilizers in extravagant quantities, and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which in ordinary farming would be

detrimental. Nevertheless, much useful information has been acquired, some of a positive and some of a negative character, by this long-conducted and extensive series of tests. The information now gained from year to year throws light in many ways on the action of fertilizers and is increasingly useful.

VALUABLE INFORMATION GAINED.

As results of these trials, it has been shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

At the time when these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is of no value as a fertilizer.

The use of sulphate of iron, which at the time these tests were begun, was highly recommended by an authority at that time eminent, as a reliable means of producing increased crops, has also been proven to be almost useless for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a most valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proven to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and on No. 8, also in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate was used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year 10 pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under. The growing of carrots and potatoes on one-half of the cereal plots has been discontinued since 1898 and each plot of the wheat, barley and oats has occupied the full tenth of an acre.

In 1890 clover was again sown on all the plots, which produced a good growth during the season and was ploughed under in October.

APPLICATION OF FERTILIZERS DISCONTINUED.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series.

In 1900 all the fertilizers on all the plots were discontinued, and it is proposed to continue to grow the same crops on all these plots from year to year without fertilizers for some years, sowing clover with the grain each season. In this way it is expected that much information will be gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which have been used on these plots since the experiments were begun.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover to advantage on the Indian corn and root plots, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their place in the proportion of 12 pounds per acre, and no fertilizers were applied. The clover on these plots has made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and thus add to the fertility of the soil, and will be left over for further growth next spring and ploughed under for the roots about May 1 and for corn about the middle of that month. Then roots and Indian corn will again be sown. This course will be continued for some years, growing Indian corn and roots every second year, and common red clover the alternate season. No fertilizers were applied in 1900, and it is proposed to discontinue their use entirely for some years, so that the effect on these crops of the ploughing under of clover every second year may be carefully studied under the varying conditions presented by these more or less exhausted plots.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, excepting in 1894 ; and the varieties used were as follows:—In 1888-89-90 and 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, the Rio Grande wheat was used, when, owing to lack of germinating power in the seed, a larger quantity was required. In 1895, 1896, 1897, 1898, 1899 and 1900, Red Fife wheat was used in the usual quantity of 1½ bushels per acre. In 1900, the Red Fife was sown May 5, came up May 18, and was ripe from August 17 to 18.

The season of 1899 was favourable for the growing of spring wheat at Ottawa and has given in most instances crops above the average.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Twelve Years.			13th Season, 1900. Variety, Red Fife.			Average Yield for Thirteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then.	21	10	3,839	24	45	5,475	21	$26\frac{7}{13}$	3,965
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then.	21	$26\frac{4}{12}$	3,883	29	40	5,500	22	$4\frac{4}{13}$	4,007
3	Unmanured from the beginning.	10	$17\frac{11}{12}$	1,849	13	45	2,155	10	$33\frac{11}{13}$	1,873
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' Phosphate was used. No fertilizer has been applied since then	10	$22\frac{11}{12}$	1,965	15	10	2,770	10	45	2,027
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	12	$31\frac{8}{12}$	2,842	13	..	3,005	12	$33\frac{11}{13}$	2,855
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898 500 lbs. of Thomas' Phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	18	$26\frac{6}{12}$	3,206	22	50	4,430	18	$46\frac{10}{13}$	3,300
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	12	$43\frac{10}{12}$	2,372	13	20	4,165	12	$46\frac{8}{13}$	2,510
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	10	$42\frac{4}{12}$	1,980	12	15	3,260	10	$49\frac{9}{13}$	2,078
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.	11	$36\frac{6}{12}$	1,809	11	55	2,865	11	$37\frac{12}{13}$	1,890
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.	12	$57\frac{11}{12}$	3,041*	12	..	2,880	12	$53\frac{6}{13}$	3,029

* This plot suffered from water in 1900.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH—*Continued.*

No. of Plot.	Fertilizers applied each Year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Twelve Years.			13th Season, 1900. Variety, Red Fife.			Average Yield for Thirteen Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizer has been applied since then............	13	$55\frac{10}{12}$	2,736	18	20	3,835	14	$16\frac{2}{13}$	2,821
12	Unmanured from the beginning..........	9	$40\frac{5}{12}$	1,742	11	10	2,880	9	$47\frac{4}{13}$	1,830
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then....	11	$43\frac{2}{12}$	1,900	15	40	2,740	12	$1\frac{5}{13}$	1,965
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then....	15	$9\frac{2}{12}$	2,360	14	50	3,840	15	$7\frac{9}{13}$	2,474
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then....	13	$17\frac{11}{12}$	2,320	16	35	2,840	13	$33\frac{1}{13}$	2,360
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then....	15	$19\frac{5}{12}$	2,067	15	40	2,935	15	21	2,134
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then . .	12	$5\frac{2}{12}$	2,332	16	10	2,480	12	24	2,343
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then....	12	$26\frac{3}{12}$	1,881	12	45	1,785	12	27 [illegible]	1,874
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.	13	$20\frac{5}{12}$	1,486	14	25	1,965	13	$25\frac{5}{13}$	1,523
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....................	12	30	1,880	11	45	2,010	12	$26\frac{7}{13}$	1,890
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer has been used since then	12	$33\frac{2}{12}$	1,895	14	40	1,720	12	$42\frac{12}{13}$	1,882

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897, 1898, 1899 and 1900. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows : 1889, 1890 and 1891, Saale ; 1892, Goldthorpe ; 1893, Duck-bill ; and in 1894, 1895, 1896, 1897, 1898, 1899 and 1900, Canadian Thorpe, a selected form of the Duck-bill. In 1900 the Canadian Thorpe was sown on May 7, came up May 18 and was harvested from August 1 to 8.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of plot.	Fertilizers applied each Year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Eleven Years. Yield of Grain. Per acre. Bush	lbs.	Average Yield for Eleven Years. Yield of Straw. Per acre. Lbs.	12th Season, 1890. Variety, Canadian Thorpe. Yield of Grain. Per acre. Bush	lbs.	12th Season, 1890. Variety, Canadian Thorpe. Yield of Straw. Per acre. Lbs.	Average Yield for Twelve Years. Yield of Grain. Per acre. Bush	lbs.	Average Yield for Twelve Years. Yield of Straw. Per acre. Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898 inclusive. No manure has been applied since then.....	34	$35\frac{5}{11}$	3,034	36	22	2,860	34	$42\frac{4}{12}$	3,019
2	Barn-yarn manure, fresh, 15 tons per acre, each year to 1898 inclusive. No manure has been applied since then.............	35	$14\frac{7}{11}$	3,260	34	33	2,520	35	$12\frac{2}{12}$	3,198
3	Unmanured from the beginning...	13	$20\frac{1}{11}$	1,546	9	33	1,135	13	$5\frac{2}{12}$	1,512
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used, no fertilizer has been applied since then.................	13	$47\frac{2}{12}$	1,444	16	2	1,275	14	$7\frac{5}{12}$	1,430
5	Mineral phosphate, untreated, finely ground; 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then	19	$35\frac{10}{11}$	2,232	26	2	2,270	20	$13\frac{1}{12}$	2,235
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	27	$44\frac{2}{11}$	2,404	26	27	2,080	27	$38\frac{9}{12}$	2,377
7	Mineral phosphate, untreated, finely ground, 500 lbs; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.............	23	34	2,391	32	24	2,520	24	$21\frac{2}{12}$	2,402
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas's phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	19	$26\frac{2}{11}$	1,688	20	45	1,980	19	$31\frac{9}{12}$	1,712
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been used since then..................................	20	$35\frac{5}{11}$	1,871	18	21	1,105	20	$26\frac{3}{12}$	1,807
10	Mineral superphosphate. No. 1, 350 lbs; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....	27	$2\frac{2}{11}$	2,369	31	42	2,220	28	$13\frac{6}{12}$	2,357

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Eleven Years.			12th Season, 1900. Variety, Canadian Thorpe.			Average Yield for Twelve Years.		
		Yield of Grain.		Yield. of Straw.	Yield of Grain.		Yield. of Straw.	Yield of Grain.		Yield. of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizer has been applied since then.....	26	$8\frac{4}{11}$	2,516	26	32	2,395	26	$10\frac{4}{12}$	2,506
12	Unmanured from the beginning...........	13	1	1,211	11	32	1,260	12	$43\frac{7}{12}$	1,215
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.. ..	13	$33\frac{3}{11}$	1,375	16	7	1,905	13	$43\frac{1}{12}$	1,419
14	Bone, finely ground 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....	22	19	2,010	25	35	2,370	22	$32\frac{4}{12}$	2,040
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then....	21	37	2,329	23	6	2,325	21	$42\frac{5}{12}$	2,329
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....	22	$3\frac{1}{11}$	1,836	22	39	1,725	22	$6\frac{1}{12}$	1,827
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....	18	$11\frac{5}{11}$	1,987	23	16	1,340	18	$31\frac{10}{12}$	1,933
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....	17	$34\frac{5}{11}$	1,741	20	15	1,150	17	$44\frac{10}{12}$	1,692
19	Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then............................	27	$44\frac{5}{11}$	2,056	23	26	1,580	27	$26\frac{11}{12}$	2,016
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer has been applied since then.....................	19	$22\frac{1}{11}$	1,632	21	7	1,310	19	$28\frac{10}{12}$	1,605
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer has been applied since then............................	20	$7\frac{8}{11}$	1,826	20	15	1,445	20	$8\frac{4}{12}$	1,794

OAT PLOTS.

The quantity of seed sown per acre on the oat plots, was 2 bushels in 1889 and 1890; $1\frac{1}{2}$ bushels in 1891, 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897, 1898, 1899 and 1900. The varieties used were as follows: In 1889, Early English; in 1890, 1891, 1892 1893, Prize Cluster; and in 1894, 1895, 1896, 1897, 1898 1899 and 1900, Banner. In 1900 the Banner was sown May 5, came up May 19, and the plots were harvested from August 15 to 17.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$ ACRE EACH.

Number of Plot.	Fertilizers applied each Year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Eleven Years. Yield of Grain. Per acre.		Average Yield for Eleven Years. Yield of Straw. Per acre	12th Season, 1900. Variety, Banner. Yield of Grain. Per acre.		12th Season, 1900. Variety, Banner. Yield of Straw. Per acre	Average Yield for Twelve Years. Yield of Grain. Per acre.		Average Yield for Twelve Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898 inclusive. No manure has been applied since then.....	49	$3\frac{1}{11}$	3,136	69	9	3,520	50	$26\frac{3}{12}$	3,168
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898 inclusive. No manure has been applied since then.............	54	$18\frac{6}{11}$	3,345	66	21	3,665	55	$18\frac{9}{12}$	3,372
3	Unmanured from the beginning	30	$20\frac{5}{11}$	1,484	47	2	1,955	31	$33\frac{1}{12}$	1.523
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer has been applied since then	30	$23\frac{3}{11}$	1,691	42	12	1,660	31	$22\frac{7}{12}$	1,688
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.............	48	$21\frac{2}{11}$	2,719	52	17	2,235	48	$32\frac{2}{12}$	2,679
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.	45	$1\frac{9}{11}$	2,569	71	6	3,115	47	$7\frac{10}{12}$	2,615
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then......................	46	$9\frac{5}{11}$	3,161	65	15	3,025	47	$29\frac{9}{12}$	3,150
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizer has been applied since then.......	40	$8\frac{2}{11}$	2,275	51	16	3,430	41	6	2,371
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been used since then	35	$\frac{10}{11}$	1,938	51	31	1,840	36	$14\frac{9}{12}$	1,930
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then.	46	21	2,772	53	28	2,275	47	$7\frac{5}{12}$	2,731

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$ ACRE EACH—*Continued.*

Number of Plot.	Fertilizers applied each Year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Eleven Years. Yield of Grain. Per acre.		Average Yield for Eleven Years. Yield of Straw. Per acre	12th Season, 1900. Variety. Banner. Yield of Grain. Per acre.		12th Season, 1900. Variety. Banner. Yield of Straw. Per acre	Average Yield for Twelve Years. Yield of Grain. Per acre.		Average Yield for Twelve Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
11	Mineral superphosphate, No. 1, 350 lbs.: nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. No fertilizer has been applied since then....	36	$4\frac{9}{11}$	2,376	45	20	2,830	36	$31\frac{7}{12}$	2,414
12	Unmanured from the beginning...........	21	$9\frac{7}{11}$	1,493	26	31	1,035	21	$25\frac{7}{12}$	1,455
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then	33	$25\frac{8}{11}$	1,960	41	16	2,295	34	$13\frac{7}{12}$	1,988
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then...	37	$27\frac{10}{11}$	2,176	62	2	2,495	39	$28\frac{7}{12}$	2,203
15	Nitrate of soda, 200 lbs per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then....	46	$7\frac{4}{11}$	2,684	64	19	2,705	47	$25\frac{4}{12}$	2,686
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then.	34	24	2,103	55	10	2,270	36	$14\frac{4}{12}$	2,117
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then.	43	$21\frac{7}{11}$	2,958	51	31	2,335	44	$11\frac{1}{12}$	2,906
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then ...	35	$13\frac{3}{11}$	2,078	44	29	1,675	36	$6\frac{1}{2}$	2,044
19	Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then........................	35	$5\frac{10}{11}$	1,931	43	8	1,830	35	$28\frac{9}{12}$	1,923
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer has been applied since then.	32	$24\frac{8}{11}$	1,995	39	9	1,670	33	$9\frac{3}{12}$	1,968
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer has been applied since then...	33	$6\frac{7}{11}$	1,851	49	4	1,580	34	$17\frac{9}{12}$	1.828

METEOROLOGICAL OBSERVATIONS.

TABLE of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1900; maximum, minimum and mean temperature for each month, with date of occurrence, also Rainfall and Snowfall.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days' Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		In.	In.	In.		In.	
Jan.....	26·02	3·90	22·11	14·95	39·0	23rd	—11·5	24th	0·54	15·00	2·04	15	5·00	12th
Feb....	24·29	8·01	17.91	16·96	41·0	9th	—21·5	2nd	1·95	14·75	3·42	11	4·50	5th
March ..	27·52	7·42	20·10	17·47	42·0	19th	—14·2	18th	0·08	40·00	4·08	13	12·00	2nd
April ...	55·36	34·13	21·23	44·74	75·0	21st	20·0	9th	1·12	...	1·12	7	0·48	18th
May....	66·04	40·72	25·32	53·38	86·2	14th	26·5	11th	3·70	......	3·70	14	1·50	8th
June....	78·19	55·15	23·04	66·67	86·8	27th	46·0	4th	3·83	......	3·83	13	1·73	2nd
July....	78·69	58·36	20·32	68·52	88·2	7th	48·8	1st	6·45	......	6·45	16	2·34	17th
August .	79·66	57·82	21·84	68·74	91·2	25th	48·0	4th	2·84	......	2·84	12	0·99	7th
Sept ...	70·65	51·10	19·55	60·87	93·8	2nd	36·0	19th	4·15	......	4·15	14	0·77	16th
Oct.....	64·42	43·00	21·41	53·70	79·6	4th	24·0	20th	1·61	......	1·61	11	0·46	8th
Nov.....	39·99	26·25	13·73	33·11	63·8	1st	4·9	17th	3·00	17·00	4·70	22	6·00	19th
Dec.....	24·75	8·33	16·41	16·53	38·0	20th	—15·8	10th	0·21	21·25	2·33	19	6·00	5th & 13th
									29·48	108·00	40·27	167		

Rain or snow fell on 167 days during the 12 months.
Heaviest rainfall in 24 hours, 2·34 inches on July 17.
Heaviest snowfall in 24 hours, 12·00 on March 2.
It will be seen the highest temperature during the 12 months was 93·°8 on September 2.
The lowest temperature during the 12 months was —21·°5 on February 2.
During the growing season rain fell on 7 days in April, 14 days in May, 13 days in June, 16 days in July, 12 days in August and 14 days in September.
April shows the lowest number of days on which rain fell, viz., 7.
Rain or snow fell on 22 days in November.
Total precipitation during the 12 months, 40·27 inches, as compared with 41·63 inches during 1899.

RAINFALL, Snowfall and total Precipitation from 1890 to 1900, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
	Inches.	Inches.	Inches.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	36·02
1899	33·86	77·25	41·63
1900	29·48	108·00	40·27
Total	294·35	961·10	390·54
Yearly average for 11 years	26·75	87·37	35·50

RECORD of Sunshine at Central Experimental Farm, Ottawa, for the Years 1898, 1899 and 1900.

Months.	1898. Number of days with Sunshine.	1898. Number of days without Sunshine.	1898. Total hours Sunshine.	1898. Average Sunshine per day.	1899. Number of days with Sunshine.	1899. Number of days without Sunshine.	1899. Total hours Sunshine.	1899. Average Sunshine per day.	1900. Number of days with Sunshine.	1900. Number of days without Sunshine.	1900. Total hours Sunshine.	1900. Average Sunshine per day.
January	21	10	97·4	3·14	18	13	91·2	2·94	18	13	96·4	2·46
February	15	13	67·5	2·41	19	9	102·1	3·64	20	8	110·2	3·93
March	26	5	171·5	5·53	17	14	124·1	4·00	26	5	177·9	5·73
April	29	1	233·8	7·79	26	4	228·8	7·62	26	4	212·7	7·09
May	30	1	186·3	6·01	27	4	225·4	7·27	27	4	241·6	7·79
June	29	1	184·9	6·16	29	1	257·1	8·57	27	3	282·2	9·40
July	30	1	272·8	8·80	29	2	271·3	8·75	29	2	225·1	7·26
August	Instrument out of order.				31	0	271·2	8·74	30	1	270·7	8·73
September	27	3	166 9	5·23	22	8	128·9	4·29	22	8	164·4	5·48
October	21	10	106·0	3·41	23	8	120·4	3·88	26	5	148·7	4·79
November	21	9	91·3	3·04	17	13	77·0	2·56	18	12	71·7	2·39
December	15	16	54·3	1·75	17	14	50·1	1·61	16	15	34·0	1·09

WILLIAM T. ELLIS,
Observer.

VISIT TO GREAT BRITAIN AND FRANCE.

On July 21, I took passage in the steamer *Dominion*, from Montreal, and after a very pleasant journey arrived in Liverpool on the 31st of the month.

VISIT TO GARTON BROS., WARRINGTON.

One of the first places visited in England was the establishment of Garton Bros., a firm well-known for the useful and interesting work they have done in the cross-fertilizing of cereals. Their seed establishment is at Warrington, about an hour's ride by rail from Liverpool, while their experimental grounds are at Newton le Willows, some 6 or 7 miles distant from Warrington. After looking carefully over the interesting samples of new sorts of grain shown at the seed warehouse, I was driven to the experimental grounds, where under the guidance of the senior member of the firm, the grounds were inspected. These included a very large number of plots of different varieties of cereals, among which there were many new sorts of wheat with heads of various forms and sizes. Among the crosses of Miracle or Eldorado wheat, *Triticum turgidum*, there were some very curious things, also some very large and robust looking heads, crosses of Greek Summer wheat, *Triticum durum*, with other varieties. Many fine new strains of the ordinary winter wheat were also seen.

In barley there were a number of interesting sorts, one of which is said to be very stiff in the straw, and another to have smut-resisting qualities.

The work which has been done by the Garton Bros. in oats interested me much. In some of their new crosses the naked oat of China has been used as one of the

parents, and evidence of the influence of this oat on the progeny is visible in the character of the panicle, in which the number of grains in the cluster is increased. These crosses seem likely to be very productive. Sufficient quantities of some of the more promising of these new cereals have been secured for experimental tests in Canada.

AGRICULTURAL EDUCATION AND EXPERIMENTAL AGRICULTURE IN ENGLAND.

A large sum is annually paid by the government of Great Britain to the forty-nine County Councils of England for technical education. This amounted to £826,450 in 1897-8, and £834,908 in 1898-9, being an average of over four million dollars per annum. A proportion of this is spent in educational and experimental work in agriculture. The total amount spent during the past year for the promotion of agriculture was about £80,000, nearly $400,000. The work is carried on in many different ways, but a considerable sum is spent in conducting agricultural field experiments, a large proportion of which are experiments with manures on various crops. Other sums are devoted to horticulture, dairying, poultry keeping, bee keeping, farriery, &c. In many instances this work is carried on *directly* under control of committees of the council, who establish agricultural and horticultural schools, and dairy institutions, direct field experiments in agriculture, arrange for competitions in ploughing, hedging, ditching, horse-shoeing, &c., give scholarships in agriculture to those attending schools and colleges, organize travelling dairies and employ lecturers in agriculture and horticulture, who visit and address farmers in different parts of the county. Reports are also published of the work carried on.

Further grants for special work in connection with agricultural education and research are given by the Board of Agriculture. These grants in 1898, amounted in all to £7,350, nearly $36,750. The sums given vary from £50 to £800.

There is thus a considerable amount of money spent in promoting agriculture in England, much of which is no doubt well used, but in other instances monies are probably less judiciously expended.

The following are cited as examples of expenditure:—Surrey, a county which spends from £4,000 to £5,000 in connection with agricultural education, is said to spend this sum in part *directly* under control of a committee of the council on horticultural school gardens, instruction at shows, and on allotments and scholarships, and *indirectly* instruction is given in bee keeping, under direction of the Berks Bee Keepers' Association, and demonstrations in field experiments by the University Extension College at Reading, an institution which this county conjointly with other counties supports.

The county of Cornwall, which spends from £1,200 to £1,500 yearly, expends this directly through the technical instruction committee, assisted by local district committees.

Experiments are conducted in the manuring of permanent pastures, turnips and other crops. Experiments are also conducted with different sorts of fruits.

In several instances two or more counties combine in carrying on experimental work or in maintaining agricultural schools, for example Durham, Cumberland, and Northumberland combine in maintaining the agricultural work of the Durham College of Science.

VISIT TO COCKLE PARK.

A visit was paid to the experimental farm worked by these three counties, known as Cockle Park, which is about ten miles from Newcastle-on-Tyne, and consists of about 450 acres. Many experiments were in progress there with fertilizers on different crops ; some varietal tests are conducted with oats, including some of the new varieties.

of Garton Bros. Trials are also made of rotation plots. A number of experiments were in progress in the fattening and breeding of sheep, and in testing the effects of fertilizers on the nutritious qualities of pasture grasses. Experiments have also been tried with lime as a preventive of finger and toe disease in turnips, using it in varying quantities, from 1,000 to 8,000 pounds per acre. Experiments covering several acres are in progress in tree growth, ten blocks of half an acre each or less being devoted to this purpose. A well stocked and well kept nursery is also an interesting feature on this farm. Excellent work along many useful lines has been carried on at this institution for the past seven years, under the able management of Prof. Wm. Somerville, who has recently been appointed Professor of Agriculture at Cambridge University.

EXPERIMENTAL GROUNDS AT LAUNCESTON, CORNWALL.

The experimental grounds at Launceston, Cornwall, were also visited. This is one of three stations carried on by the County Council of Cornwall. This station was entirely devoted to experiments in horticulture. The land occupied was about two acres, a short distance from the town of Launceston. The soil was a good clay loam, and most of the land was occupied by different varieties of apple, pear and plum trees, some of which were beginning to bear. The varieties were mostly of the well-known standard sorts. A small area was devoted to the testing of raspberries, strawberries, gooseberries, and red and black currants. Tests were also being made with tomatoes.

READING COLLEGE AND BRITISH DAIRY INSTITUTE.

A pleasant day was spent at Reading, in visiting Reading College and the British Dairy Institute. Under the guidance of Prof. D. A. Gilchrist, director of the agricultural department, I was shown through the buildings, and learned much regarding the working of these useful institutions. The College and Institute occupy adjoining sites in the town of Reading, within a few minutes walk of the railway stations. The College was founded in 1892; the British Dairy Institute, which was established at Aylesbury in 1888, by the British Dairy Farmers' Association, was removed to Reading in 1896, to the newly-erected building, where it was placed under the management of a joint committee, representing the British Dairy Farmers' Association and Reading College.

The building of the British Dairy Institute is very complete in its appliances for practical teaching and experimental work. In addition to the well-arranged lecture rooms and reading room, it has large milk-receiving, butter-making and milk-testing rooms, four rooms for the manufacture of pressed, unpressed and soft cheeses, and seven rooms for the ripening of different varieties of cheese.

The higher certificate in dairying is granted to successful students who have spent one year at the college, six months at an approved dairy institute, and six months on a dairy farm.

A short course in dairy instruction is also provided, of ten weeks, when successful candidates receive certificates.

Reading College is managed by a council, in which are representatives of the County Councils of Berkshire, Buckinghamshire, Dorset, Hampshire and Oxfordshire, subsidies being granted by all these bodies to meet the cost of carrying on the agricultural work of the institution. The College is affiliated with Oxford, and has, in addition to the agricultural teaching, departments of letters and science, music and the fine arts, and provides teaching for about 1,000 day and evening students.

The diploma in agriculture requires a two-years course at the College, and one year in practical work on a farm. A shorter course in agriculture is also provided, of six weeks, at the end of which time certificates are awarded to successful students. This is designed for candidates already familiar with farm work.

The College undertakes work in the adjoining counties in connection with field experiments, and lectures at rural centres, and advises with regard to insect pests, plant diseases and the manuring of crops. Field experiments are carried on at several different points in each of the counties represented on the college council, the use of the land required for this purpose being given by prominent farmers. The size of the plots are from one-tenth acre, sometimes less, to one-fourth acre each, and from eight to twelve plots are used in each case. The lines of experimental work carried on have been with manures as top dressings on pasture ; also with crops of turnips and potatoes; rotation experiments, tests of varieties of oats, experiments in sowing lucerne and sanfoin; also with lime as a remedy for the disease known as finger and toe in turnips. In order to give a more permanent character to the experimental work, the Hampshire County Council has recently leased 2½ acres of land at Botley, as a permanent station for field experiments.

VISIT TO CAMBRIDGE.

A visit was also made to Cambridge and a profitable day spent with Prof. Wm. Somerville, Professor of Agriculture in Cambridge University. In addition to the lectures on practical and scientific agriculture given at Cambridge arrangements have recently been made for the establishment of an experimental farm in connection with the University where experiments in agriculture of a permanent character will be conducted. A visit was paid to this farm which consists of about 180 acres, located some eight miles from the town of Cambridge.

About 150 acres of this land are available for experimental work, and 30 acres are in permanent pasture. It is proposed to devote about 60 acres of good even arable soil to experiments with grain and other important farm crops. A sufficient area will also be set aside for horticultural investigations. There are at present about 2½ acres of land on the farm in forest and it is proposed to set aside 6½ acres more for experimental work in tree planting. The land appears to be very suitable for the purpose, is of good quality, well situated and very even in character. At the time of my visit possession of this property had just been acquired. Work will be begun with experimental plots in the spring of 1901.

Prof. Somerville has also the supervision of 40 acres of land in Northampton, which has been rented for a term of years to determine the quality and nutritious properties of the grass grown with different fertilizers ; the experiments being similar to those which Prof. Somerville has heretofore carried on so successfully at Cockle Park. Forty acres are under similar control in Hampshire and a like area in Cambridgeshire. In Norfolk and Essex from 16 to 20 acres are also under this line of experiment.

It was my purpose to visit several other of the more important experimental stations and teaching colleges in England, particularly those at Wye, under the direction of Prof. A. D. Hall, where a number of important lines of work are being conducted ; the Woburn Experimental Farm, under direction of Dr. Voelcker. The Woburn Experimental Fruit Farm, established by the Duke of Bedford, and under the management of Prof. Spencer Pickering. The agricultural and horticultural school at Holmes Chapel, under the Cheshire County Council. The field experiments conducted at Bramford, under a committee of the East Suffolk County Council and the Agricultural College at Cirencester. The limited time, however, at my disposal was not sufficient to permit of the carrying out of these plans.

KEW AND ROTHAMSTED, &c.

A profitable day was spent at the Royal Gardens at Kew inspecting the large number of interesting trees, shrubs and plants growing there, and another day was devoted to Rothamsted.

The recent lamented death of Sir John Lawes had thrown a gloom over Rothamsted and deprived me of the pleasure I had hoped for of renewing the acquaintance formed in 1886 with that venerable experimenter. Sir Henry Gilbert was also absent, but Dr. N. H. Miller, who was in charge, very kindly showed me over the grounds and answered my many inquiries.

The grain harvest was over at the time of my visit, but I saw the plots of roots grown with and without fertilizers, also the grass plots from which a second crop was then being cut. It was a great pleasure to see these experimental grounds once more, and with Dr. Miller's kindly help the visit was made a very instructive one.

Visits were also made while in England to some of the leading nurseries—to Dickson's extensive grounds at Chester, where a large number of most interesting things were seen ; to Sutton's seed warehouses and trial grounds at Reading, to Barr & Sons, the well-known growers of narcissus and paeonies and to Amos Perry's noted establishment for hardy perennials, at Winchmore Hill, near London. At all these places valuable material was secured for experimental tests in Canada.

WALES.

Several days were spent in Wales, this was early in August when the crops were still on the ground. Much of the grain over most of the country travelled was lodged, and the crops seemed light, and the general condition of the farming of the country appeared to be backward. The small black Welsh cattle were common and Welsh sheep very plentiful, but the swine seen were of a very nondescript character.

The objective point in this journey was the Agricultural College at Aberystwith, and the scenery of the country passed through was delightful. On the way many large tree plantations were observed where bare hills had been clothed with a luxuriant growth of European larch, many of the plantations having attained a sufficient size to furnish merchantable timber.

Aberystwith is very prettily situated on the sea shore, and from the college buildings there are fine views of the water.

The teaching carried on in the agricultural department at the college consists of a three years' course for the degree in agriculture, a two years' course for a diploma, and a seven weeks' course for farmer's sons, when, if the prescribed examination is passed, a certificate of proficiency is given.

In dairying several courses of instruction are carried on, a twenty weeks' course, a ten weeks' course, and also one of six weeks. Instruction in dairying is also given at local centres by means of travelling dairies, and courses of lectures on agriculture are also given to farmers in rural centres in the adjoining counties.

About two acres of land convenient to the college are under control of the agricultural staff, and an additional area of 30 acres has been recently secured. One acre is devoted to an experimental orchard, about one half of which has been planted with apples, pears and plums. Half an acre is in use for testing different sorts of vegetables and a quarter of an acre is devoted to experiments with grain, in testing the influence of fertilizers of different sorts on their growth.

An association has been formed there of ex-students, to carry on experiments with fertilizers on their individual farms, and there are now in all about 40 of these co-operative stations.

SCOTLAND.

Glasgow and Edinburgh were the points visited. A few hours were pleasantly occupied in examining the collection of trees, shrubs and plants brought together in the Glasgow Botanic Gardens, and in visiting the buildings in course of construction for the great exhibition to be held there in 1901. The chief object in my visit to Glasgow was to gain some information regarding the West of Scotland Agricultural College.

This useful agricultural institution was established a year ago, under the direction of Prof. R. Patrick Wright. Prior to this it existed as a department of the Glasgow Technical College, and there was a separate dairy school at Kilmarnock. Now the dairy school and a recently acquired experimental farm of 200 acres has been united with the Agricultural College, which will supply the means for permanent experimental work. The dairy school is carried on during the summer months only. The building where the teaching work is done is conveniently situated in a central part of the city of Glasgow, and is provided with all the appliances necessary for effective teaching. Practical agriculture, agricultural chemistry and botany are the leading branches taught.

In connection with this College an extensive system of experimental work has been conducted for the past eight years on about fifty different farms, in the central and southwest counties of Scotland. The experiments are very comprehensive in their character, and are for the most part along the following lines : The effects of farm-yard and artificial manures on hay, grain, roots and potatoes. Investigations regarding the mealing power of oats grown with different fertilizers, the effect of fertilizers on the quality of the hay produced, their influence on the size and quality of potato tubers. Rotation of crops has been the subject of many experiments, and many varietal tests have been conducted with oats. Tests have also been carried on in the feeding of sheep. The more prominent farmers in different parts of Scotland have taken much interest in this work, and are free in offering the use of such limited portions of their land as may be required for carrying on these experiments. No payment is made to the experimenters, but the manures and seed are usually supplied. Each farm where experiments are in progress is visited by a member of the staff, at least once during the season, when lectures are frequently given in the locality, and the results are subsequently published in bulletin form. The College is affiliated with Glasgow University, and students who attend the full course of three years in the college and pass the examinations, obtain the degree of B. Sc. in the University. The dairy sessions are for ten weeks, and include practical work on butter and cheese. Students who succeed in passing the examinations receive certificates at the end of the course.

THE DALMENY EXPERIMENTAL GROUNDS.

These were established and are maintained by Lord Rosebery, in connection with his large estate at Dalmeny, a few miles from Edinburgh. At the time of my visit I was so fortunate as to meet both Mr. Drysdale, Lord Rosebery's factor, and Mr. John Hunter, who has charge of the scientific research work at Dalmeny. These gentlemen courteously showed me through the experimental grounds, and explained the objects in view in the various trials being made. Experiments were in progress with wheat, barley and oats, and with different fertilizers on these crops, also tests regarding the unexhausted value of manures, which had been applied to previous crops for three or four years. On these plots crops were now being grown, and would be grown for several years in succession without manures.

In the experiments conducted at Dalmeny, lime has been found very useful to all sorts of crops, in the form of an annual limited dressing of about 450 pounds per acre.

These experimental grounds, as explained by Mr. Drysdale, had been established by Lord Rosebery for the purpose of finding out the best method of producing the best possible crop, at the least possible cost, and the experience gained by the experimental plots was made good use of on the larger fields on the farm.

MEETING OF THE BRITISH ASSOCIATION.

On leaving Scotland a visit was paid to Bradford, in Yorkshire, where the meeting of the British Association was being held. On an invitation extended by the president of the Section of Economic Science, I prepared the following paper on experimental agriculture in Canada, which was read before the Association.

RESULTS OF EXPERIMENTAL WORK IN AGRICULTURE IN CANADA, UNDER GOVERNMENT ORGANIZATION, BY DR. WM. SAUNDERS, DIRECTOR CANADIAN EXPERIMENTAL FARMS.

There is probably no country in the world where nature has been more liberal in the stores of fertility provided in the soil, or where the land has greater capacity for the production of food for the human race than in Canada. While the resources of the Dominion in its minerals, its forests and its fisheries are great and valuable it is in the soil that the greater wealth of the country lies. The immensity of the area of good and fertile land in Canada is very imperfectly understood even by those who have had the opportunity of visiting the country, and but a very small proportion of the arable land has yet been brought under cultivation.

The climatic conditions in Canada are very dissimilar in different parts, and are not favourable everywhere for the production of the same crops. Very large areas, however, particularly in the great plains of Manitoba and the North-west Territories, are specially adapted for the production of cereals, particularly wheat of the highest quality. In other and more limited districts conditions prevail which render them very suitable for the growing of fruits. Nearly all the arable lands of the Dominion offer advantages for mixed farming, for the growing of different sorts of grain, grasses, roots and other forage plants, and for the raising of cattle, swine, sheep and poultry, and for the production of butter and cheese. More than half of the entire population are engaged in agricultural pursuits, but the population is as yet sparse, and the area of unoccupied land so very large that no adequate conception can be formed as to the vast quantities of food products which Canada could produce were its inhabitants at all proportionate to its resources.

With such conditions it is apparent that the developing and fostering of the agricultural interests of Canada is a subject of pre-eminent importance to all classes of her people, and is one which frequently engages the attention of both the federal and provincial governments.

In 1884, the House of Commons appointed a select committee to inquire into the best means of developing and encouraging the agricultural interests of Canada. This committee made a careful inquiry into the subject, also as to the disadvantages and wants experienced by agriculturists in Canada, taking evidence from various persons, who had made a special study of the different branches of industry included under the general term Agriculture, and of others having a scientific knowledge bearing on this subject. In the report subsequently submitted to the House of Commons, the substance of the evidence accumulated is thus summarized :—

'Notwithstanding the great progress made in recent years, it appears that there is a large amount of defective farming in this country. In the cultivation of cereals, roots and grasses there is want of periodical change of seed, selection of improved varieties, a proper rotation of crops, with a lack of thorough tillage and a knowledge of the value and suitability of manures. The value of manures is, in many cases, unheeded, and much fertilizing power is lost through negligent exposure and the waste of liquid manures. In stock-raising the chief deficiencies are the want of pure-bred males, lack of knowledge of the adaptability of breeds to particular conditions throughout the Dominion, the want of better pasture and more abundant tree shelter. In the production of butter, the milk is frequently not properly cared for, nor is suitable

attention paid to the selection of milch cows, and the food given is often deficient in nutriment and in milk-producing qualities.

'Low grades of butter are attributable to want of skill in its manufacture and want of improved apparatus. In cheese making, the need of greater skill and want of scientific knowledge is also felt. In the cultivation of fruit a great want is experienced in many sections of hardier varieties, and of varieties with improved keeping qualities. There is also a deplorable want of knowledge regarding the insects and diseases injurious to fruit trees.'

This committee also reported that in the replies they had received to a number of questions submitted to many leading farmers in every part of the Dominion, a large proportion advised the establishment of experimental farms, not only a central one, but also branch farms in every province. The protection of farmers against the sale of fraudulent fertilizers was also urged. The committee recommended that the government establish an experimental farm or farms where experiments might be carried on in connection with all branches of agriculture and horticulture, and that the results of the work conducted should be published from time to time and disseminated freely amongst the farmers of the Dominion.

No action was taken by the government on this matter until November, 1885, when, on the accession of the Honourable, now Sir John Carling, to the position of Minister of Agriculture for the Dominion, he instituted measures for the accumulation of further information so that the fullest data might be available, and the experimental farms so much needed established on the most approved plans without further delay. Particulars regarding experimental stations then in operation in Europe and America were obtained and published, and during the session of parliament for 1886, an Act was introduced and passed almost unanimously, authorizing the government to establish a central experimental farm and four branch farms. The principal or central farm was to be located at or near the capital, Ottawa, where it was to serve the purposes of the two larger provinces, Ontario and Quebec The branch farms were to be distributed as follows :—

One for the Maritime provinces jointly, one for Manitoba, one for the North-west Territories and one for British Columbia.

The work which was to be undertaken at these several experimental farms was thus set forth in the Act.

(a.) Conduct researches and verify the experiments designed to test the relative value, for all purposes, of different breeds of stock, and their adaptability to the varying climatic or other conditions which prevail in the several provinces and in the the North-west Territories ;

(b.) Examine into scientific and economic questions involved in the production of butter and cheese ;

(c.) Test the merits, hardiness and adaptability of new or untried varieties of wheat and other cereals, and of all field crops, grasses and forage plants, fruits, vegetables, plants and trees, and disseminate among persons engaged in farming, gardening or fruit-growing, upon such conditions as are prescribed by the Minister of Agriculture, samples of such surplus products as are considered to be specially worthy of introduction ;

(d.) Analyze fertilizers, whether natural or artificial, and conduct experiments with such fertilizers, in order to test their comparative value as applied to crops of different kinds ;

(e.) Examine into the composition and digestibility of foods for domestic animals;

(f.) Conduct experiments in the planting of trees for timber and shelter ;

(g.) Examine into the diseases to which cultivated plants and trees are subject, and also into the ravages of destructive insects and ascertain and test the most useful preventatives and remedies to be used in each case ;

(h.) Investigate the diseases to which domestic animals are subject ;

(i.) Ascertain the vitality and purity of agricultural seeds ; and

(j.) Conduct any other experiments and researches bearing upon the agricultural industry of Canada, which may be approved by the Minister of Agriculture.

In October, 1886, I had the honour of being appointed Director of the experimental farms for Canada, and under Sir John Carling, was intrusted with the work of selecting the necessary sites also in the choice of the officers required to carry on the work of the several institutions. Within two years the land for the several farms was secured, the necessary officers appointed, most of the buildings erected and the farms put in practical operation. The central farm was located near Ottawa, the branch farm for the three eastern provinces at Nappan, Nova Scotia, a central point near the boundary of New Brunswick and fairly convenient to Prince Edward Island. The experimental farm for Manitoba was placed at Brandon, that for the North-west Territories at Indian Head, in Assiniboia, and the farm for British Columbia at Agassiz, in the coast climate of that province.

In the choosing of these sites the purpose in view was to have them so located as to be fairly representative of the larger settled areas in the provinces in which they were placed, while in the arrangement of the work such experiments as would be most likely to be beneficial to the larger number of settlers in each case were among the first to engage the attention of the officers in charge.

Twelve years have passed since this work was inaugurated and during that time agriculture in Canada has made unprecedented advancement. While it is not claimed that this progress has been wholly due to the work and influence of the Dominion Experimental Farms, much credit is justly due to the various measures carried on by the useful organisations established by the several provinces. There is, however, no doubt that the institutions established by the Federal Government have been a most important factor in this connection. The progress referred to has resulted in improving the condition of the agricultural population all over the country, and in a vast increase in the exports of agricultural products.

Investigation and experimental research has been carried on along all the lines of work laid down in the Act which originated these farms and a great mass of important facts have been accumulated in all branches of agriculture, and those sciences which contribute to a thorough knowledge of its governing laws as may be seen in the annual reports presented to the government.

There is probably no employment which engages man's attention, that requires more skill and more general information than farming. Competition is keen throughout the civilized world, and the farmer must turn to practical account every advantage within his reach bearing on the improvement, in the quality of his products and in lessening the cost of their production if he is to maintain and improve his position.

When the experimental farms were planned it was intended that they should become bureaus of information to which farmers could apply from time to time to aid them in the solution of difficulties which frequently present themselves during the progress of farm work. Evidence of their usefulness in this way is furnished in the rapid increase of the correspondence carried on with farmers in all parts of the Dominion. In 1889, the year after the farms had become fairly organised, the number of letters received was about 8,000. During 1899 there were received at the several experimental farms 69,669 letters, of which written replies were sent to 36,590, the remainder were of such a nature as to admit of their being answered by printed circulars. In addition 215,000 reports and bulletins were sent out. There is thus a constant flow of information going to Canadian farmers from all the experimental farms which is producing excellent results.

It is, as a rule, a difficult matter to bring about rapid changes in the ideas and practice of farmers, but as soon as they are convinced that experimental work is carried on in a practical manner by persons competent to give information, that it is

undertaken in their interests and with the special object of making farming more profitable their sympathy and co-operation is assured.

The subject of experimental agriculture covers much too large a field to permit of its being treated in a comprehensive manner in a single address. I can, therefore, but refer briefly to a few important points in connection with the work which has been done by the Canadian Experimental Farms, such as will indicate the general trend of the work and serve as specimens of the many lines of research undertaken.

The principles which underly successful crop-growing in Canada may be thus summarized:

Maintaining the fertility of the land, mainly by the proper care and use of barn-yard manure and the ploughing under of green clover, thus adding fertility and humus.

Adopting a judicious rotation of crops.

Following the best methods of preparing the land.

Early sowing.

Choosing the best and most productive varieties.

The selection of plump and well-ripened seed.

Along these several lines many experiments have been conducted.

Continued efforts have been made to gain knowledge as to the best methods of maintaining and adding to the fertility of the land. In this connection, special attention has been given to investigations to determine the best methods of handling and using barn-yard manure, the universal fertilizer which is more or less available everywhere to the average Canadian farmer. Experiments continued for eleven years have shown that a given weight of manure taken fresh from the barn yard is equal in crop-producing power to the same weight of rotted manure. It has also been shown by repeated tests that fresh manure loses during the process of rotting from 50 per cent to 60 per cent of its weight. The effective use of barn-yard manure so as to obtain the best results with the least waste is without doubt one of the most important problems connected with successful agriculture, for on this material the farmer's hopes of maintaining the fertility of his land and thus providing for a succession of good crops are mainly based.

During the past eleven years annual tests have been made to gain information on the relative value of artificial manures, used separately and in combination, on nearly all the more important farm crops, and the average results of this work have been published. These continued experiments with artificial fertilizers, used alone, have given results which are disappointing, considering the large proportion of available plant food they contain. One reason for this lies probably in the fact that these fertilizers contain no humus and that the proportion of vegetable matter in the soil has been much reduced by constant cropping. The capacity of the soil for holding moisture has been lessened, to the detriment of its crop-producing power.

Experiments have also been conducted for several years in the ploughing under of green clover to enrich the land, and it has been demonstrated that clover seed can be sown in all the eastern provinces of Canada and in the coast climate of British Columbia to advantage with all cereal crops, without lessening the grain crop for the current year, and that after the grain is cut the clover grows luxuriantly, acting as a catch crop during the latter part of the season. Green clover is specially valuable to the land, for the reason that it absorbs while growing large quantities of nitrogen from the air which is stored up in its tissues. A heavy mat of growth is produced by the autumn, which, when ploughed under, adds considerably to the available nitrogen in the soil as well as to the store of humus. The proportion of nitrogen thus added to the land has been found to be equal to that obtained from a dressing of 10 tons of barn-yard manure to the acre. Considerable supplies of potash, phosphoric acid and lime are also taken up by the clover plant during its growth, a part of which is gathered from depths in the soil not reached by some other farm crops. In this way the clover is practically an enricher of the soil to some extent in these other important elements.

That the land has been much improved by this treatment has been shown in increased crops on many plots, when compared with adjoining plots on which no clover had been sown. With the oat crop in one series of experiments, the average increase for the first year was 28 per cent in the weight of the grain produced and 78 per cent in the weight of the straw. In the second year, when barley was sown on the same series of plots without any additional fertilizer, the increase in the weight of grain produced on the plots which had been treated with clover was 29 per cent, and the increase in the weight of straw, 35 per cent. In a similar course of experiments conducted with potatoes, the plots treated with clover gave an average increase in the weight of the tubers of 28 per cent.

In preparing the land for crop different methods are adopted in different parts of the Dominion. In the eastern provinces the advantages arising from fall ploughing have been repeatedly shown. The exposure of the soil to the influence of frost, sunlight and air is beneficial, and spring work is materially advanced, and crops can be got in earlier by the general adoption of this practice. On the North-west plains it has been found of great advantage to 'summer fallow' a part of the land each year. This practice conserves moisture, destroys weeds and brings the farmer much larger crops. The yield of wheat on land which has been summer-fallowed will average fully one-third more than on land which has been prepared by fall or spring ploughing.

That increased crops result from early sowing has been fully demonstrated by the tests carried on at the experimental farms. These experiments with early, medium and late sowings have been conducted for ten years on plots of one-tenth acre each on land very uniform in character. The same preparation has been given to the soil in each case and the same lots of seeds have been used for each sowing. Forty-eight plots have been devoted to this experiment, eight of which have been sown at the very earliest time practicable with two varieties each of wheat, oats, barley and pease. A second series has been sown at the end of a week, and others at the end of each subsequent week, until six successive sowings have been made. These plots have all been harvested and threshed separately and the result published each year. The best crops have been had from the second sowings, made just one week after it was possible to sow the seed; beyond this, delay in sowing has resulted in loss, which has become more serious as the delay has been greater. The average of the ten years' experiments shows as follows:—

With wheat a delay of one week beyond the period named has entailed a loss of over 30 per cent ; two weeks, 40 per cent ; three weeks, nearly 50 per cent, and four weeks, 56 per cent of the crop.

With oats a delay of one week has caused an average loss of over 15 per cent ; two weeks, 22 per cent ; three weeks, over 32 per cent, and four weeks, about 48 per cent.

In the case of barley a delay of one week has resulted in an average loss of 23 per cent ; two weeks, 27 per cent ; three weeks, 40 per cent, and four weeks, nearly 46 per cent.

With pease the loss in crop from delay has been less. A delay of one week has lessened the crop to the extent of 4 per cent ; two weeks, 12 per cent; three weeks, 22 per cent, and four weeks, 30 per cent.

The results of these experiments have led farmers generally to pay more attention than formerly to early sowing, and in this way crops have been improved.

Another important consideration in connection with successful farming is the selection of the best varieties of seed for sowing, taking into consideration productiveness, quality and earliness of maturing. That there are varieties more productive and earlier in ripening than other sorts has been abundantly proven.

During a five years' test of 41 varieties of oats, all of them sown each year on the same day, and on similar soil, the results have demonstrated the relative productiveness of certain sorts. Each year a list has been published of the best twelve in the series, and during the whole period of five years only fifteen varieties have found their

way into this select list, and nine of the varieties under test have appeared among the best twelve every year.

Similar evidence has been furnished with spring wheat, thirty-one varieties of which have been under trial for a like period. In this instance sixteen of the thirty-one sorts have appeared among the best twelve during the five years' trial, and nine of the varieties have appeared each year in that list. In the case of barley the evidence furnished in this direction is still more striking.

In spring wheat the difference in yield between the different sorts under uniform conditions as to treatment has ranged from 31 to 16 bushels per acre. Oats from 89 bushels to 42 bushels, barley from 58 to 33 bushels, and pease from 46 bushels to 20 bushels per acre. The importance of taking advantage of this variation in yield, and of encouraging the growth of the more prolific sorts becomes more apparent when we consider the large area under cultivation. As an example, the addition of a single bushel of oats to the average crop of Canada adds to the profits of the Canadian farmers more than £200,000 or one million dollars.

After careful and continued experiments have shown that any variety is specially promising, such variety is cultivated on a larger scale, so as to admit of its free distribution among the farmers of the Dominion. This grain is grown on the experimental farms, and is distributed chiefly from the central farm at Ottawa, forwarded in small bags through the mail. The samples are sent on personal application only from 3 to 10 pounds being forwarded to each farmer. Only one variety is obtainable by an applicant each year, and with this restriction, the quantity sent from the central farm every year for the past three years has averaged over 60 tons. The applications received each season have averaged more than 30,000. Those farmers who take good care of the samples received usually have at the end of the second season sufficient seed for a considerable acreage, and henceforward have all they require for their own seed and some surplus to sell to their less careful neighbours. By this method these better varieties of grain are soon spread all over the country, and the average yield of the more important crops is thus increased.

In this way the farmer is directly benefited, and with the help of the reports and bulletins published by the experimental farms, he is kept informed of the general work in progress, and is brought into sympathy with it.

Many varieties of grain have been brought to Canada for test from nearly all the grain growing countries of the world. New sorts of wheat, barley, oats and pease have also been produced at the experimental farms by cross-fertilizing with the object of combining the good qualities of varieties, more especially with a view of obtaining increased vigour, greater productiveness, and an early maturing habit. During the past ten years more than seven hundred new sorts have thus been produced and tested, and among these there are quite a number of promising varieties. Experiments have also been conducted for a series of years to ascertain the quantity of seed grain most profitable to sow per acre, the depth in the soil at which it is most advantageous to place the seed in the different climates in the Dominion, and the relative advantages of sowing broadcast and with different sorts of drills.

The object lessons which have been given in the raising of fodder crops and the converting of these into ensilage, thus providing succulent food for cattle, have greatly stimulated the dairy industry, especially the manufacture of butter in winter ; also the fattening of steers, thus affording profitable employment for farm labour during the winter months. The experiments which have been conducted with reference to the economical production of butter of the highest quality, and the best management of milk to secure the most complete separation of the butter fat, have commanded much attention from those engaged in this special industry. The experience gained by the feeding of cattle, sheep and swine, and in the testing of those breeds especially adapted to produce the highest quality of beef, mutton and pork, has stimulated and aided the stock industries. The business in eggs and dressed fowls for the table, has also been advanced by the publication of results obtained from experiments conducted in the poultry branch.

The instructive experiments which have been carried on with many varieties of large and small fruits have served to show where these can be grown to the greatest advantage, and has been helpful in promoting fruit-growing over those large areas where the climate is so well adapted to the growth of fruits of high quality. By cross-fertilization on hardy wild forms new and improved sorts have been produced, some of which will, it is believed, be hardy enough to succeed in all those portions of the country where the climate is less favourable to fruit-growing. The information which has been given on the cultivation of vegetables and the varieties best suited to the different climates of the country has also proved of much value.

Experiments in tree planting were begun at all the experimental farms as soon as practicable after their organization. At the central farm twenty acres are devoted to forest experiments to determine the relative growth of the more important timber trees under different conditions. Sixty acres of the same farm are in use as an Arboretum where trees and shrubs from many countries are under test to detrmine how far they are suitable for growth in eastern Canada. Smaller areas are being devoted to the same purpose on the branch experimental farms. As the need for forest shelter is very great on the open plains in the North-west country special attention has been given to the encouraging of tree planting for shelter in Manitoba and the North-west Territories. About sixty to seventy thousand trees have been planted on each of the western experimental farms in shelter belts, shelter blocks, avenues and hedges, furnishing examples as to the best methods of planting and giving information as to the cost of planting per acre. To aid others in starting this useful work there has been distributed free through the mail, on application during the past twelve years, 1,261,000 young forest trees in lots of about 100 each, and more than 7 tons of tree seeds have been sent to settlers in sample bags of one pound each, every package containing sufficient to produce with reasonable care from 500 to 800 young seedlings. The results of this work are now everywhere apparent. On homesteads in almost every part of the North-west plains, there are small plantations of forest trees which afford shelter for buildings and stock; also for the growing of garden vegetables, small fruits and flowers, and at the same time make the dwellings of the settlers more attractive by converting bare and uninviting surroundings into pleasant ad sheltered homes.

The practical help which has been rendered by the officers who have charge of the more scientific part of the work has also been a source of satisfaction to the public. The information given by my colleague, Dr. James Fletcher, as to the best remedies for the destruction of noxious insects and for resisting the inroads made by fungus diseases from which grain, fruit and other crops have suffered has been much appreciated, and the good results obtained from the use of the measures recommended have been very satisfactory to farmers and fruit-growers. The subject of noxious weeds has also been fully investigated and the best measures pointed out for their subjugation.

In the chemical division, under the charge of Mr. F. T. Shutt, investigations have been conducted to determine the nutritious constituents in many fodder plants which have been analysed at different stages in their growth to ascertain the period when these plants may be cut to the greatest advantage. The farmers of Canada have profited much from this valuable information. In many other lines of chemical research bearing on agriculture much useful information has been given regarding the care of and the action of manures, the usefulness of mucks, muds and marls as fertilizing agents, on the composition of soils in different parts of the Dominion and on many kindred subjects.

Much information is given each year by the agriculturist, the horticulturist, the poultry manager and other officers of the central farm. Also by the superintendents and other officers of the branch farms who attend meetings of farmers held in all parts of the country where opportunities are afforded of giving fuller explanations concerning all branches of the work in progress at the several experimental farms.

In the meantime the occupation of farming has been elevated in the eyes of the community. It is no longer looked upon as a drudgery suited only to the dull and slow going. It is now regarded as a suitable field for the exercise of the higher intelligence of more cultivated minds, and is recognised as a calling requiring much skill to conduct it successfully.

A few figures will illustrate the progress made along some of the lines referred to. The exports of wheat and flour have assumed large proportions. In 1884 the value of the cheese export from Canada was £1,450,397 ; in 1898 it was £3,512,553. During the same period the value of the butter exported has nearly doubled. The exports of cattle have also increased considerably. The trade in pork has made a phenomenal growth. In 1884 the value of the exports of hams, bacon, pork and lard was less than £200,000; in 1898 it amounted to more than £1,600,000. The increase in the exports of many other agricultural products have also been most encouraging.

DISCUSSION FOLLOWING ADDRESS.

An interesting discussion followed the reading of this paper from which some extracts are given.

'Professor Somerville (Professor of Agriculture at Cambridge) thought they were greatly indebted to Dr. Saunders for an interesting and exhaustive paper, which had come at an extremely opportune time. Many persons in this country had for the past few years been endeavouring to formulate a suitable scheme for the improvement on scientific lines of agriculture in England, Scotland and Ireland, and those who were engaged in this work had kept their eye carefully on what was being done on the other side of the Atlantic—in the United States as well as in Canada. As the head of the experimental work in Canada, Dr. Saunders had given to the world, in his annual report, yearly a volume that described exhaustively the experimental work of the Dominion, and they in England had derived great benefit from the perusal of this work. Canada had begun her experimental work on thorough and complete governmental lines, and at first it did not seem as if it would lead to very satisfactory results, for experiment by Act of Parliament looked to be a very cast-iron mode of procedure, but practically the experiment had resulted in an entirely free hand being given to those appointed to carry on the work, with very excellent results. In this country the work had been suported by the government to some extent, and it had greatly benefited from that support. The great difference, however, between Canada and this country was that here they looked more largely to local effort. Practically there was no experimental or educational work of an agricultural character in this country entirely maintained from government sources. One of the conditions under which government support was given was that the localities themselves where the work was carried on showed sufficient interest in the work to warrant the government in giving substantial support. They knew how difficult it was to excite local interest, especially in an agricultural community, in work of that kind, but if they could get local farmers upon the committees, they would bring them into closer contact with the work, and valuable information would be disseminated throughout the district. Though the work in this country had only been systematised since 1890, a great deal of experimental work had been done as far back as the end of the last century. Individual workers had carried out an enormous number of experiments in the last quarter of the last century, which had been described in a number of volumes. Then, the old Board of Agriculture came into existence in 1792 and expired in 1819, and the presidents of that Board had always strongly insisted on the value of experimental farms as an aid to agriculture. But between the early years of the present century and the year 1890 very little experimental work had been done with government support. In 1890, however, they had started on a new era, and the amount of work

put in during the last ten years had been fairly satisfactory. They had yet much to learn as regarded the best lines of procedure, but they were now fairly well settled down to steady work. The line they were following was to have a central establishment with institutions distributed throughout the country.

EXPERIMENTAL WORK IN ENGLAND.

'At present in England there were eight or nine institutions that received government support in the shape of annual grants. These grants, supplemented by local support, were sufficient to provide a staff of instructors and also facilities for the conduct of experiments. The educational work was carried on on orthodox lines, and the experimental work was devised and carried out on the initiative of the workers at the various centres. The results achieved during the last few years had been very extensive and had led to a belief, on the part of the farmers themselves, that the work was of distinct value to agriculture. But the value of the work was not so much in the way of placing models and examples, as it were, before the farmers as in making the farmers think in a way they had not thought in the past. Agriculturists, if they were not stirred up in some way, were apt to go along on lines that they had followed in the past. In many cases these lines were satisfactory, but also in many cases it was likely that improvements would be effective. When the farmers saw that these improvements led to better results, they began to devote more intelligence to their business. He considered that the work done in Canada was extremely valuable to farmers in this country, and he believed great advantage would be derived from the improvements in the varieties of cereals and other plants. In the United States, also, especially in Wisconsin, valuable work had been done in the direction of improving the yield of cereals, not by extending the area planted, or by better manuring and tillage, but entirely by introducing new varieties of seeds. The improved yield from new varieties was often perfectly astonishing, and that without any increased expenditure on labour or manure. With regard to the advantages Dr. Saunders found could be derived from growing clover along with cereals, that was a point that had strongly been insisted upon by Humphrey Davy in the first decade of the present century, but he (the speaker) did not think the practice would be of value in this country, for the simple reason that the best farmers here hoed their wheat, and of course it was impossible to hoe the wheat if the clover plants were sown along with it. He did not propose to make any attempt to criticise Dr. Saunders's paper, which deserved the most careful consideration, and would no doubt prove of very great value to English agriculturists.

'CANADIAN FARMS.

'Professor A. D. Hall (Principal of the South-Eastern Agricultural College, Wye) said that after Dr. Saunder's description of the work of the Canadian experimental farms, the feeling of agriculturists in this country must be one of envy. In Canada they saw a great scheme started in a great way by the government. They put the whole thing in the hands of competent experts, and they found a great scheme started in all its details suited to meet the wants of the country. Such a scheme was bound to succeed. He could not help comparing that with the haphazard, casual way in which things had been done in this country. It was not that the English landowner and farmer were not interested in experimental work, or had not initiated such work, because some of the very best experimental work had been done for years in this country by individuals and voluntary societies, but, as he had said, the work was of a casual, haphazard kind. Very good work had undoubtedly been done by the Royal Agricultural Society, and the establishment of the magnificent experimental institu-

tion at Rothamsted was entirely due to private initiative. By these means a good start was made, and a further impetus was given to the work ten years ago, but the fact that the work was scattered about, was under the control of various authorities, and was partly voluntary, while important vested interests had sprung up in connection with it, had prevented the State from stepping in and elaborating a scheme that would completely cover the whole ground. He could not agree with Professor Somerville that there was any great amount of good work being done. They were still experimentalising, but outside Rothamsted there was very little of pure research going on in this country. It was possible only by governmental initiative, with the weight of a great department to carry on the work, to create and continue a real research station, which could work, as it were, in the dark for a long period before they could expect to bring about good results. There was another point in which it struck him Canada had secured a great advantage: they had disassociated the teaching side from the experimental side. In this country we were making the mistake of supposing that the two things of teaching and experimenting should be in the same hands. It seemed to him to be impossible to have an educational and a research station together unless there were absolutely separate staffs. The teacher conducted his operations from an educational point of view, and having due regard to the interests of his pupils, but this attention to the needs of the pupils prevented research being properly and thoroughly carried on. If they wanted an experimental station of the best type, they must have a separate staff, giving up the whole of their time to the work. Dr. Saunders's paper would help to clear up their ideas on the subject. Local authorities in this country who largely controlled the work, very much wanted to have clearer ideas as to what was required. At present the work was chiefly educational, and mostly consisted of demonstrations to the farmers of such improved methods as were generally known, and there was little of real experimental work, such as was done at Rothamsted. Until we were able to separate these three departments of the work—the educational, the demonstrative, and the experimental—from each other, they would not make much progress.

'The President, in closing the discussion, said that of course the circumstances of one country differed enormously from those of another country with regard to the methods by which experimental work could be initiated and carried on, and no doubt in a new country where the occupants of the land were scattered far apart, with little individual co-operation, the influence of a central power was essential to the starting of experimental work. As Professor Somerville had explained, it was not the practice in this country to begin work of that kind with State help, but for the State to come in and supplement the work of individuals and voluntary societies. But it should be remembered that the State had lately taken a very long step in the direction of enabling the local authorities to carry on work of this kind—not wholly research work, it was true, but work of a demonstrative character, giving the farmers an object lesson as to what could be done, and what the individual experimenters had worked out in the past. After all, when the State diverted large funds to the assistance of the County Councils to enable them to carry out technical education in all its branches, an important step was taken to place in the hands of the local authorities the power to carry on this experimental agricultural work. There were many points in Dr. Saunders's paper which contained suggestions that were of great value to agriculturists in this country, and they were certainly greatly indebted to the author of the paper for the great amount of time and labour that he had devoted to its preparation.'

VISIT TO FRANCE.

At the close of the meeting of the British Association I went to Paris. I was very favourably impressed with the Canadian exhibits, and particularly so with the agricultural and horticultural collections which I had the responsibility of bringing together.

The exhibits of grain, both in straw and cleaned, were very fine, and attracted deserved attention. The brightness of the straw and the plumpness of the grain spoke volumes for the climates of this country, and the taste with which these and other agricultural products had been displayed excited general admiration.

CANADIAN EXHIBITS OF GRAIN AND FRUITS AT THE PARIS EXHIBITION.

This collection owed much to the experimental farms. From the branch farms at Brandon and Indian Head many of the most attractive sheaves of grain in the straw, and some of the brightest samples of grain, had been sent. Good specimens had also come from Agassiz, B.C., and from Nappan, N.S., with a large quota from the Central Farm. All the officers in charge had used their best efforts towards success, and the results were good, and much credit is due to Mr. W. H. Hay, the accountant of the farm, for the tasteful manner in which he placed the material, and the skill used in disposing of it to the best advantage.

The agricultural exhibits were not, however, by any means confined to the material from the experimental farms. Good exhibits were prepared by most of the provinces; a large number of farmers also contributed to this work from all parts of the Dominion.

The exhibits of fruit were also a great success. Some 1,200 glass jars, filled with beautiful specimens of our more perishable fruits, reached their destination safely. The largest contribution in this section was from Ontario, and the collection gathered from the fruit-growing districts in this province was put up chiefly at Guelph, under the direction of the Horticulturist, Professor Hutt. The Horticulturist of the Central Experimental Farm, Mr. W. T. Macoun, prepared a fine exhibit of the more perishable fruits grown here, and Mr. R. B. Whyte contributed some of the finest specimens from his large garden in Ottawa.

In Nova Scotia collections were made in the Annapolis Valley and by the Horticulturist at the Experimental Farm at Nappan; some specimens of fruit for preserving also came from Prince Edward Island. Quebec was well represented in her more perishable fruits, both from the eastern and western sections of the province, and many fine samples were sent from British Columbia by Mr. Thomas A. Sharpe, Superintendent of the Experimental Farm at Agassiz. Many of these had been grown on that farm, and some were produced on the farms of other growers in the Fraser River valley.

Large quantities of fresh fruits of late-keeping sorts were forwarded from the fruit-growing districts in Ontario, Quebec, Nova Scotia, British Columbia, New Brunswick and Prince Edward Island, and put in cold storage, and from these supplies, well preserved and handsome specimens of nearly all of our best varieties of winter apples of the growth of 1899 were available for display until the close of the exposition in November, 1900. Early in October a large supply of fresh fruits were received—the growth of 1900. These were followed by further shipments, including many varieties of excellent apples, pears and peaches. These added very much to the attractiveness of the exhibit and kept up the general interest in it to the end. In plate 2 a view is given of a part of this display. Such continued success has never before attended any exhibit of fruit, and the number of awards received from the international jury is a gratifying evidence of the appreciation in which these exhibits were held.

THE POMOLOGICAL CONGRESS.

At this important gathering, held in Paris from September 12 to 14, Canada was represented by Mr. A. Dupuis, Secretary of the Canadian Commission for Paris, and the writer. We were both honoured by being invited to the platform and introduced

to the large assembly as Canadian representatives. There was a large and distinguished gathering, including eminent pomologists from nearly all the civilized countries in the world. Many interesting papers were presented, which were followed by animated discussions. Among the subjects discussed were the planting of fruit and forest trees on the roadside, which brought out much difference of opinion; the weight of evidence, however, was in favour of using fruit trees for this purpose. The replanting of orchards, the trenching of land, the use of fertilizers on fruit trees, the cultivation of the banana in the French colonies, and the teaching of agriculture and horticulture in the public schools were all discussed. This latter subject called out much difference of opinion. The results of this teaching were commented on favourably by some, while other speakers were of opinion that the progress made by the pupils had not, on the whole, been satisfactory, and it was only where the teachers themselves took a great interest in the subject and imbued the pupils with some of their enthusiasm that much real progress was made, and that the number of teachers so interested was comparatively small.

A paper was presented by Mr. A. Dupuis on 'Horticulture in Canada,' which was very well received. The proceedings of the congress lasted nearly three days, and was well attended throughout.

I also attended the Congress of Botanists, where Canada had three representatives: Mr. James M. Macoun, Assistant Naturalist of the Geological Survey; Mr. Robert Hamilton, of Grenville, Quebec, and myself.

AGRICULTURAL COLLEGE AT GRIGNON.

A visit was paid to this excellent and well-known National Agricultural School, in company with Dr. Jas. Mills, President of the Ontario College of Agriculture at Guelph, and others. The college at Grignon has commodious buildings and is thoroughly equipped for teaching purposes. It is well supplied with apparatus and material suitable for chemical and physical demonstrations and for the teaching of agriculture and botany. Good examples were also seen of animals belonging to different breeds of stock.

After inspecting the buildings, we visited the fields where experimental work was in progress, and found everything nicely arranged. The series of experiments were well planned and instructive, all calculated to serve an excellent purpose in the instruction of the students. Experiments are conducted with many different sorts of wheat, barley and oats, but the grain plots were all harvested. Samples, however, were shown us in the building, both in straw and cleaned grain. Rotation plots are carried on. Comparative tests were in progress as to the relative value of farm manure and lupins and vetches, ploughed under. Other experiments were also being made with fertilizers. About 230 acres of land, in all, are used for the purposes of this college. The number of pupils in 1900 was 220, 100 of which are boarders; the others live outside the college. About 25 per cent of the pupils are farmers' sons. Fifty varieties of sugar beets were under test in plots of about 8 by 10 feet. Experiments were also in progress with potatoes, using for seed a medium-sized whole potato, as against the half of a large-sized potato. No reports or bulletins are published. Farmers generally are not encouraged to visit this school. The school is established especially for students and for the advancement of scientific work in connection with agriculture, but no means seem to be adopted to make farmers acquainted with the particulars of the work in progress.

VISIT TO NORMANDY.

A journey was made into Normandy to the district of Calvados to inspect one of the large tree-growing establishments for which this district is celebrated. The firm whose place I visited work about 100 acres in all, and grow young trees and shrubs by

the million. About 110 men are employed, and the wages paid are from 50 to 80 cents a day. The larger number of hands receive the lower wage, the more skilled workers 60 cents, and a very few only of the men most skilled in grafting, budding and propagating receive 80 cents per day. The hours for work in the nursery firms in that district, of which there are a large number, are as follows:—From April 1 to October 1, from 5 a.m. to 7 p.m., with 2 hours in all off during the day for meals. From October 1 to November 1 the hours are from 5.30 a.m. to 6.30 p.m., and from November 1 to April 1 they range from 6.30 a.m. to 6 p.m. Some women are also employed in weeding the beds of young trees and nursery stock, which are about 6 feet wide and 50 to 100 feet or more in length, with narrow paths between them. This weeding is all done by hand, the only tools I saw used were the fingers, and the workers receive 30 cents per day; they begin to work at 8 a.m., but the hours for closing are the same as those for the men. The general wages paid to labourers by farmers in this district is 30 cents per day and board. The hours of work in summer are from 4 a.m. to 8 p.m., with two hours rest at noon. The board is very plain, and consists mainly of bread and soup three times a day, with a more or less liberal portion of Normandy cider. There are no holidays or saints days kept by the labouring people in Normandy, and they are only paid for the days they actually work. When employed by the year they occasionally get a day off, but this is a rare thing, and when employed in this way they are expected to do such work as is needed on Sundays, such as the watering of seed beds, &c.

The people look robust and very healthy, and seem quite contented. With such low wages, long hours for labour and an admirable climate for propagating, it is not surprising that young trees and shrubs can be bought in this district at very low prices.

Where men have served the same employer for 25 to 40 years, their cases are reported to the government by the municipal officers, when the government gives medals, which are much prized by those receiving them. The foreman at the nursery visited has been employed by the firm for 26 years, and the secretary for 25 years, and both of these employees had recently received medals.

AT THE VILMORINS AT VERRIERES.

A delightful day was spent at the home of the Vilmorins at Verrieres, a few miles from Paris, in company with Mr. Philippe de Vilmorin, the accomplished son of the late Henry Vilmorin, well known throughout the civilized world for his researches in agriculture and horticulture.

Many magnificent trees are growing about the home, especially cedars of Lebanon, which were decorated with their handsome bright cones. Some rare pines and spruces were seen, now grown to be large trees, the seed of which was planted by the grandfather or great grandfather of Mr. Philippe. A very interesting hybrid was seen, a cross between *Abies cephalonica* and *A. pinsapo*, intermediate in form between these two species. There were also hybrid walnuts, and many other interesting cross-bred trees.

The grain on the experimental plots had all been harvested. The plots were small, but very numerous, each of which contains from 40 to 50 plants of the variety under trial, with sufficient space between them to permit of strong growth. At harvest time two of the best and most productive of the plants are selected for seed and the remainder discarded. No attempt is made to cultivate any of the varieties on trial on a large scale until such variety has shown itself to be of special promise.

The plots during 1900 numbered about 2,500. Of these 1,000 were wheat, 900 of which are named varieties of winter wheat, including about 250 hybrids. There were also 150 varieties of spring wheat, about 100 varieties of barley and nearly 150 different sorts of oats. A few varieties only of each class are grown on a larger scale for commercial purposes.

In shrubs and flowers there were many interesting things. Among the flowers were magnificent beds of Japanese anemones and of the European cyclamen, both in full bloom. Much use was made of some of the free flowering begonias, the large beds of which were very fine and full of bloom. One of the most striking of these was *Begonia gracilis semperflorens*, of which there are rose-coloured and white varieties and one red strain called *Vernon*.

One of the most attractive flower beds seen was one of the original form of the China aster, as found growing wild in China. This is a single flower with bright blue petals and a large yellow centre, and is a most profuse bloomer. It seems singular that after florists have worked on this flower so much during the past half century, and have produced so many varied and beautiful forms, that the original type so long neglected should come back to us now as a first-class novelty.

The time was all too short to permit of more than a passing glance at a part of the wonderful variety of economic and interesting botanical products with which this charming place abounds.

AT BARON ALPHONSE ROTHSCHILDS.

On invitation from Col. G. B. Brackett, in charge of the fruit exhibit of the United States, a day was delightfully spent with him and others in inspecting the estate of Baron Rothschilds at Ferrieres, 20 miles from Paris. The estate covers an area of 6 by 20 miles, the greater part of which is used as a large game preserve, where deer and other animals are abundant, and where game birds are seen at every turn. Twelve hundred acres of this area is maintained in the most perfect manner as a park, where a vast number of species and varieties of trees and shrubs find a home. The great masses of Rhododendrons, Laurels, Yews, Aucubas, Hollies, Box and other comparatively tender things, all in the highest condition of health and vigour, demonstrated the highly favourable character of the climate of that district. The most striking feature about this beautiful park is the perfection in which everything is kept ; among the many thousands of trees and shrubs no unsightly forms are met with, and no evidence of sickliness, partial defoliation or neglect, but every specimen retains the original grace and beauty with which it has been endowed by nature, and every object is so placed as to give it sufficient room to grow without crowding. The wealth of varieties was wonderful. The unusual care shown in every particular was evident from the fact that the little lakes and ponds, in which wild water-birds of many sorts disported, had their surface skimmed several times a day by men in boats, to remove fallen leaves which at that time were dropping freely from the overhanging trees. The displays of tropical plants and the massive flowers beds about the palace-like mansion were very effective.

About 400 men were employed on these grounds, which furnished help sufficient to keep every department in good order. There was a very good aviary, with several buildings specially constructed to suit the habits of the hundreds of different sorts of birds kept there. The fruit garden was a perfect paradise; forty men were employed in it. There were wonderful collections of pears, peaches, nectarines and apples, most of them in full fruit. Many of the trees were trained against walls, but a very large number were grown as cordons, espaliers and pyramids, and nowhere could a misshapen branch or an unnecessary twig be seen, but every specimen was trained on the most approved principles, and the trees were laden with fruit.

The vegetable garden, which employed 25 men, covered a considerable area, furnishing ample room for the growing of all sorts of vegetables in the open air, while hot-beds and green-houses were available for the growth of such as were too tender to stand outside exposure, and for the growing of vegetables out of season.

There were splendid green-houses for orchids, roses, ferns, carnations, palms and other plants requiring special temperatures and treatment, where every species was grown under the most favourable conditions, and other houses provided where the less

tender material was produced in abundance, for outside decoration. It had never been my good fortune before to see grounds so superbly planted, and so remarkably well kept, and the few hours spent there were most delightfully instructive, and produced impressions which will never be effaced from memory.

JOURNEY TO ST. NAZAIRE AND BAULE.

A journey was made to the sea coast of Brittany in company with Col. F. F. Gourdeau, Deputy Minister of Marine and Fisheries, to see the results of the planting of pine forests there on the drifting sands along the ocean shore. The object of the visit was to gain information as to the probable usefulness of such planting if undertaken in Canada on similar areas where moving sands are encroaching on arable land.

Our route lay through the large sea port St. Nazaire to Baule, a thriving town built on the margin of a beautiful beach which extends in the form of a deep crescent for five or six miles. The water is shallow for a long distance out and the beach is a hard smooth sand. The whole district about here has been planted with pines where formerly it was bare and barren, and a mass of drifting sand. The plantations extend for many miles. The trees are almost all of one species Pinus maritima (=*P. pinaster*) known as the cluster pine. This is a small growing pine with large long leaves and very large cones. The trees in this district seemed to be from twenty to fifty years old or more. Their height was from 15 to 25 feet, and the diameter of some of the larger specimens, 3 feet from the ground, was about 12 inches.

M. Berthot is said to have been the planter of these pines ; the work was begun about sixty years ago and it is reported that this gentleman's family have become wealthy owing to the increase in value of the planted land.

In planting, the trees have been set out in groups of six to ten or more and placed about 2 to 3 feet apart each way, with wider spaces of 6 to 12 feet between the groups. The planting and grouping has been done irregularly, but has been so arranged as to thoroughly break the force of wind. From the bent and gnarled condition of some of these trees at outlying points it is obvious that the winds have great force here.

The planting has been entirely successful ; the drifting of the sand has long since ceased and a soil is gradually but slowly forming, mainly through the decay of successive crops of the needle-like leaves of the pines.

THE MUSHROOM CAVES.

Some hours were spent in the mushroom caves which run under parts of Paris. The entrance to these caves is outside the Orleans gate. These excavations which have been made to obtain building stone for the city are very extensive. The stone is found in layers from 30 to 50 feet below the surface, and the quarries have been worked for ages. The mushroom beds are built up about 2 feet high, 18 or 20 inches wide and rounded off at the top, with narrow paths between them. Earth mixed with stable manure is used in their construction. When the heat of the fermenting material is reduced to the most favourable temperature pieces of mushroom spawn are introduced at stated distances all through the beds, and in the course of two or three weeks mushrooms begin to appear all along the tops and sides of the beds, and are produced in quantities from day to day.

There are about 150 growers engaged in this work and several of the larger operators produce as much as 2,000 pounds of mushrooms per day. After a time the beds become exhausted when the material is carted away and fresh beds made in their place. This industry is a very interesting one, and with the requisite experience and skill seems to be a profitable undertaking.

Plate 2.—Part of Exhibit of Canadian Fruit at the Paris Exposition.

AGRICULTURAL DISPLAYS AT THE EXPOSITION.

At intervals while in Paris, when not occupied by official duties, time was found to examine carefully most of the agricultural exhibits at the exposition. Objects of interest were noted and many new varieties of cereals and other farm crops from different countries were secured for experimental test in Canada.

CORRESPONDENCE.

The following is a summary of the letters received and sent out at the Central Experimental Farm, from November 30, 1899, to November 30, 1900. Also the number of reports, bulletins and circulars forwarded by mail during the same period :—

	Letters received.	Letters sent.
Director	42,239	18,495
Agriculturist	1,476	2,127
Horticulturist	1,185	1,332
Chemist	1,026	1,453
Entomologist and Botanist	3,017	2,847
Poultry manager	1,590	870
Accountant	1,001	1,431
Totals	51,534	28,555

A large number of the letters received by the Director are applications for the publications of the farms or for samples of grain. A large proportion of these are answered by sending what is asked for. This will explain why the number received so much exceeds the number answered.

Circular letters sent, including circulars sent with samples of seed grain	39,183
Number of reports and bulletins mailed	194,073

ACKNOWLEDGMENTS.

Grateful acknowledgments are due to the director of the Royal Gardens, Kew, England, for another useful and interesting collection of the seeds of shrubs, trees and plants from northern countries. Also to the director of the Arnold Arboretum, for seeds of some rare and promising trees and shrubs. To the Department of Agriculture at Washington, U.S.A., I am indebted for many different sorts of seeds, especially cereals and vegetables ; also to Prof. John Macoun, naturalist of the Geological and Natural History Survey, and to Mr. J. M. Macoun, my thanks are due for seeds of interesting native species, collected in different parts of Canada.

I beg also to acknowledge the faithful service rendered by all the officers of the central and branch experimental farms, and for their earnest co-operation in carrying out the many lines of experimental work planned.

Hearty thanks are also due to those members of the staff at Ottawa who have rendered me efficient help in those branches of the work in progress there of which I have had personal charge. To the horticulturist, Mr. W. T. Macoun, who has supervised the labour given to the lawns, and to the trees and shrubs planted on the ornamental grounds; to the farm foreman, Mr. John Fixter, who has carefully watched over the different branches of the work, taken special charge of the fertilized plots and the larger field plots on the experimental grounds, and has aided me much by his practical suggestions and accurate notes; to Mr. Harry Fixter, who has managed the work connected with the experimental plots of cereals, fodder plots and field roots, and has taken records of the growth and yield of all the varieties grown in the uniform trial plots. I am also indebted to him for the careful management of the many details connected with the distribution of samples of seed grain and potatoes; to Mr. Wm. Ellis my sincere thanks are rendered for his careful work in testing the vitality of seeds, in the management of the green-house plants, in the propagation of the many useful and ornamental species, and in the taking of the meteorological records. In every branch of work the employees of all the farms have faithfully discharged their duties.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE AGRICULTURIST.

(J. H. Grisdale, B. Agr.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith reports on Horses, Dairy Cattle, Beef Production, Pork Production, Sheep, and Farm Crops.

During the year, I have attended a number of meetings in Ontario, Quebec, Nova Scotia, New Brunswick, Prince Edward Island and Manitoba.

I am indebted to Mr. John Fixter, farm foreman, and Mr. C. T. Brettell, herdsman, for assistance in the work carried on as well as for help in the preparation of the submitted report.

I have the honour to be, sir,
Your obedient servant,
J. H. GRISDALE,
Agriculturist.

HORSES.

There are in the farm stables at present fourteen horses. A number of these are quite old and will need to be replaced at an early date. During the year, one horse has died. His death was caused by colic. A new team was purchased in April and has proven entirely satisfactory.

Three of the above horses are required for the omnibus which runs from the farm to the city, making three trips daily. One is used for a driver and two for cart or general jobbing horses.

The remaining eight horses constitute the teams for general work upon the farm, in the gardens and orchards, upon the lawns and in the arboretum, as well as for cartage. This number of horses has, during the past year, proven to be very far short of the requirements as detailed above, and another team is very much needed.

On March 6, 1900, an experiment in feeding work horses was incepted, the end in view being to ascertain the comparative economy of feeding whole as contrasted with ground grain, also the gaining of some data as to the comparative value of oats, barley and corn as grain rations for working horses. A uniform ration of 12 pounds per diem was adopted to permit of comparing results. The experiment was discontinued after May 6, as it was found that on the heavy spring work a more varied and better ration was required than was being fed some of the horses.

It will be observed that in feeding ground vs. unground grain, the ground grain was fed to old and the unground grain to young horses.

LOT ON WHOLE GRAIN, 12 POUNDS—OATS AND BARLEY.

Horse.	Mixture Fed.	March 6, Weight.	April 6, Weight.	May 6, Weight.	Loss or Gain.	Remarks.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Polly	Oats 10	1,270	1,230	1,230	40	Unusually heavy work part of time.
Dolly	Barley 2	1,390	1,382	1,402	12	

These two animals were seven and eight years old, respectively. They continued in excellent health throughout the time of the experiment.

LOT ON GROUND GRAIN, 12 POUNDS—OATS AND BARLEY.

Horse.	Mixture Fed.	March 6, Weight.	April 6, Weight.	May 6, Weight.	Loss or Gain.	Remarks.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Rock	Oats 10	1,460	1,455	1,495	35	
Daisy	Barley 2	1,345	1,410	1,350	5	Idle part of time in March.

While this team lost considerable in weight during the time of the experiment, they continued in good health. They were in better working condition at the end than at the beginning of the feed test. Rock was eighteen years old, and Daisy twenty-one.

LOT ON CORN AND OATS (GROUND), 12 POUNDS.

Horse.	Mixture Fed.	March 6, Weight.	April 6, Weight.	May 6, Weight.	Loss or Gain.	Remarks.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Fanny	Corn 6.	1,670	1,645	1,655	15	
Ben	Oats 6.	1,575	1,575	1,512	63	

Fanny was seven years old, and Ben fifteen. In spite of 12 pounds per diem, a very light ration for such heavy horses, they appeared to thrive upon it. After the ration was increased they did better, however.

LOT ON GROUND CORN, 12 POUNDS.

Horse.	Mixture Fed.	March 6, Weight.	April 6, Weight.	May 6, Weight.	Loss or Gain.	Remarks.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Charlie............	Corn.. 12	1,315	....	....	....	Went off feed in eight days.
George............	"	1,450	1,395	1,455	5	

Charlie, aged twenty, and George twenty. Charlie could not stand this ration, and so dropped out of the experiment in a short time. George, as appears above, did well upon this ration in spite of the too great proportion of starch and fat.

PURE BRED BREEDING CATTLE.

There are on the farm at present representatives of two breeds of cattle : Ayrshires and Guernseys.

Ayrshires.

1 bull, 'Matchless Again' (8757)............... ....2 yr. old
1 cow, 'Darling' ....2 yr. old
1 calf, bull........ ....3 mos. old
1 calf, heifer....... ....8 mos. old

Guernseys.

1 bull, 'Wedgewood' (5,113)......... ....6 yrs. old
1 cow, 'Ruby' ....2 yrs. old
1 bull.......... ....2 yrs. old
1 calf.. ....6 mos. old

It is proposed to secure a few more females of each breed represented, and of a milking strain of Shorthorns. Small herds of pure bred animals of each of the three breeds will be maintained, and small graded herds of the respective breeds as well. It is hoped to gain some data as to the exact value of bulls in grading up a herd in a given time.

The services of the stock bulls are available to farmers upon payment of a moderate charge.

DAIRY CATTLE.

The herd of dairy cattle consists of 31 females, all told. They are :—

Milking Stock.

Ayrshires...... 1
Guernseys... 1
Canadian grades.. 5
Ayrshire grades...... 6
Other grades 7

Young Stock.

Two-year olds	5
Yearlings	2
Calves	4

During the year some of the older and less valuable cattle have been sold to the butcher.

The dairy cows have been fed a roughage ration of corn ensilage 35 pounds, chaff 3 pounds, hay 5 pounds, and mangels 20 pounds daily; some more, some less, according to ability to use food profitably.

The meal ration varied in quantity on the same principle, some cows getting as low as 2 pounds per diem, while in milk, and others eating as much as 10 pounds per diem. The meal ration mixture was made up of bran ½, oats 1-6, peas 1-6, and barley 1-6, in most cases, but was varied to suit individual tastes and requirements.

Much attention has been paid to the individuality of the animals, with marked results. The average yield of butter and milk has increased materially over last year, namely, from an average of 242·5 to 289·6 pounds butter, and from 5,414 to 6,455 pounds milk. This is due in a great measure to larger returns from individuals of the herd, but to a certain extent to the weeding out process, which has been most rigorously pursued, no animal falling much below last year's average being allowed to remain in the herd, heifers of course being excepted.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the local market rates for the same save in the cases of roots and ensilage, which are charged at the usual values affixed in experimental work:—

Pasture	$1 per month
Bran	$15 per ton
Oats, barley and pease	19 per ton
Chaff	4 per ton
Clover hay	5 per ton
Roots and ensilage	2 per ton

In estimating the cost of feeding heifers, they were charged for that part of the year during which they were milking, while other milkers were charged for the whole year. While dry, cows were charged at the rate of $2 per month in winter and $1 per month in summer.

The average cost of feeding has been materially reduced from last year by selection, by the feeding more freely of cheaper feed stuffs and by studying the individuality of the cows.

In estimating the value of the product, 19 cents is allowed for a pound of butter, and 15 cents per 100 pounds of skim-milk and buttermilk. The butter is manufactured in the farm dairy, and sells on the market at from 22 to 30 cents per pound, an average of about 24½ cents. This leaves 5½ cents per pound for cost of manufacture.

The following tables will be of interest, as showing the records of the individual cows, and giving some general results :—

Number.	Cow.	Breed.	Days of Milking.	Lbs. Milk.	Per cent of B. Fat.	Lbs. Butter.	Total Value of Product.	Cost of Feed.	Profits.
							$ cts.	$ cts.	$ cts.
1	Dewdrop	Ayrshire Grade	350	10,595	3·4	436·25	97 35	40 85	56 50
2	Julia		364	9,314	3·7	408·75	91 17	40 75	50 42
3	Della	Shorthorn	327	8,548	4·0	411·60	90 35	40 90	49 45
4	Begonia	Canadian Grade	267	8,975	3·6	385·80	86 05	39 30	46 75
5	Belle	Ayrshire "	316	8,429	3·7	371·40	82 56	39 25	43 31
6	Dora	" "	354	9,760	3·1	358·33	82 10	40 85	41 25
7	Polly		330	7,591	3·8	345·33	76 41	37 00	39 41
8	Gipsy	Ayrshire Grade	294	7,506	3·4	307·10	69 15	38 90	30 25
9	Forest Girl	Shorthorn "	329	6,834	4·0	324·50	69 40	38 90	28 50
10	Dairy Maid	" "	349	5,650	4·7	314·70	67 74	40 90	26 84
11	Tulip	Canadian "	271	4,342	4·7	242·50	52 22	25 50	26 72
12	Norette	" "	251	6,418	3·3	275·50	61 34	35 60	25 74
13	Florence	Shorthorn "	315	6,141	3·8	278·60	61 63	36 90	24 73
14	Theresa	Canadian "	319	5,852	4·0	281·50	61 73	37 00	24 73
15	*Ruby	Guernsey	197	3,272	4·9	188·90	40 54	17 00	23 54
16	Bloom		286	6,967	3·4	279·33	63 06	41 00	22 06
17	*Laura	Ayrshire Grade	269	4,212	3·5	180·90	40 37	22 00	18 37
18	May Belle	Shorthorn "	282	3,834	3·0	169·33	38 57	33 75	4 82
19	*Darling	Ayrshire	55	1,381	4·0	62·50	13 82	9 50	4 32
20	Hazel	Canadian Grade	222	3,479	4·0	169·20	37 09	36 20	0 89
							1,282 65	694 05	588 60

* Heifer.

—	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	Total.
Lbs. of milk	7,381	8,918	8,846	11,081	11,994	12,311	15,850	12,804	12,383	10,255	9,752	7,523	129,100
Lbs. of butter fat	324·61	335·38	317·94	429·61	374·89	438·55	542·81	475·78	455·89	411·28	420·86	337·84	4,865·44
Per cent butter fat	4·37	3·76	3·69	3·87	3·13	3·56	3·59	3·71	3·68	4·01	4·30	4·48	*3·76
Lbs. of butter	386·50	399·33	378·50	511·33	446·33	522·00	646·20	566·40	542·70	489·50	501·03	402·20	5,792·02
Lbs. of milk for 1 lb. butter	19·1	22·3	23·4	21·7	26·9	23·6	24·5	22·6	22·8	20·9	19·4	18·7	21·9

*Average.

Time of Milking Experiment.

The question of the effect of milking cows at equal or unequal intervals is one which frequently presents itself, and a small experiment along this line was conducted during the month of November. Below is submitted a particularized report of the results, while a general report or summary follows :—

TIME OF MILKING EXPERIMENT.

Period.	November.	Hours of Milking.	Darling. Morning Milk.	Darling. Morning p.c. Fat.	Darling. Evening Milk.	Darling. Evening p.c. Fat.	Hazel. Morning Milk.	Hazel. Morning p.c. Fat.	Hazel. Evening Milk.	Hazel. Evening p.c. Fat.	Ruby. Morning Milk.	Ruby. Morning p.c. Fat.	Ruby. Evening Milk.	Ruby. Evening p.c. Fat.	Theresa. Morning Milk.	Theresa. Morning p.c. Fat.	Theresa. Evening Milk.	Theresa. Evening p.c. Fat.	Total.
Average for previous 10 days.	..	6 a.m. & 4.30 p.m.	15	3·5	14	3·9	13	3·9	11	4·1	8	4·5	6	4·9	10	3·5	8	3·9	85
Period of change.	2	6 a.m. & 6 p.m.	13½	3·8	14½	3·8	13	4·4	10	4·3	6	5·8	5	5·7	9½	4·3	8	4·2	79½
	3		13½	3·9	14	3·4	12	4·6	12	4·4	5½	6·0	53	5·4	7½	3·4	6½	4·2	76½
	4		13½	3·7	14½	3·9	12½	4·8	11	4·1	5½	5·5	5½	5·8	7	4·4	6½	4·7	76
Total for period....			40½	....	43	....	37½	....	33	....	17	....	16	....	24	....	21	....	232
Milking at equal intervals.	5	6 a.m and 6 p.m.	13½	3·8	13½	3·7	11	4·4	9½	4·3	5½	6·0	5½	6·0	7½	4·8	6	4·8	72
	6		14	3·6	13½	3·4	10½	4·6	9	4·1	5	6·0	5½	6·0	7	4·8	6½	4·6	71
	7		13	3·4	14	3·7	9	4·4	9½	4·5	5	6·0	5½	6·4	6½	4·6	6½	4·1	69
	8		13	3·8	13½	3·9	11	4·5	10	4·0	5	5·5	5½	5·1	7	4·3	7	4·6	72
	9		12	3·5	13	3·7	10½	4·3	10	4·4	5	5·7	5	5·2	7½	4 7	7	5·0	70
	10		13	4·0	13	3·7	11	4·3	10	4·3	5½	6·1	5½	6·2	6½	4·8	7	4·4	71½
	11		12½	4·1	12½	3·9	11	4·4	10½	4·8	5½	6·5	5	6·6	7	5·3	6½	4·7	70½
	12		13	3·9	13	3·9	11½	4·6	10	4·7	6	6·4	5	6·5	7½	5·2	6½	4·6	72½
	13		13½	4·0	13½	3·8	11½	4·4	10½	4·6	5½	6·4	5½	6·5	8	5·1	7	5·2	75
	14		13	3·7	13½	3·9	12½	4·7	11	4·4	5½	7·1	5	6·9	8	4·7	7½	5·0	76
Total for period....			130½	....	133	....	109½	....	100	....	53½	....	53	....	72½	....	67½	....	719½
Period of change.	15	6 a.m. & 4.30 p.m.	14	4·0	12½	4·5	11	4·4	9	4·4	5½	6·8	4	6·0	8	4·8	6½	4·4	71½
	16		14½	3·7	12	4·4	11½	4·3	8½	4·7	6	5·4	4	6·3	9	4·6	6	4·9	71½
	17		15	3·9	12	4·7	12	4·4	8½	4·4	5½	5·2	4	6·2	8½	4·5	6	5·0	71½
	18		14	3·9	11½	4·6	12	4·6	8½	4·8	5½	5·5	4	6·9	7½	4·4	5	5·0	68
Total for period....			57½	....	48	....	46½	...	34½	....	22½	....	16	....	33	....	17½	..	282½
Milking at unequal intervals.	19	6 a.m. and 4.30 p.m.	14½	3·9	11½	4·4	11½	4·1	8½	4·4	5	5·5	4½	6·1	7	4·7	5½	5·2	68
	20		14	3·5	12	4·4	11½	4·0	8½	4·8	6	5·8	4	6·3	7	5·0	5½	5·4	68½
	21		14	3·1	12	3·6	12	3·8	9	4·2	6½	5·7	4½	6·0	8½	4·6	6	4·4	72½
	22		15	3·4	12½	4·0	12½	4·0	9	4·6	6	5·5	4½	6·2	8	4·1	6	4·9	73½
	23		14½	3·6	13	4·2	11½	4·1	8½	4·6	5½	5·2	4½	5·6	8	4·5	6½	4·6	72
	24		14	3·2	12½	4·0	12½	4·0	9	4·5	6½	4·8	4½	6·4	8	4·0	6	4·2	73
	25		11½	4·0	11	4·5	12	4·4	8	4·3	6	5·8	4½	5·9	8	4·3	6	4·6	67
	26		13	3·5	12	4·4	12	4·0	8½	4·4	7	5·7	4	6·3	7½	4·4	5½	4·5	69½
	27		13½	3·8	12	4·2	11½	4·0	8½	4·8	6	5·6	4	6·0	7	4·4	5	4·7	67½
	28		12½	3·6	12	4·4	11	4·3	8½	4·9	6	5·3	4½	6·4	7½	4·6	6	4·6	68
Total for period....			136½	....	120½	....	118	....	86	....	61½	....	43½	....	76½	....	58	....	699½

SUMMARY.

DARLING—AYRSHIRE.

Average.	Average for Previous 10 Days.	1st Period of Change.	Milking Equal Intervals.	2nd Period of Change.	Milking Unequal Intervals.
Per cent fat morning	3·5	3·80	3·78	3·87	3·56
" " evening	3·9	3·61	3·75	4·55	4·21
" " whole day	3·7	3·71	3·76	4·18	3·86
Yield of butter fat	1·061 lbs.	1·037 lbs.	0·988 lbs.	1·102 lbs.	0·993 lbs.

HAZEL—GRADE.

Per cent fat morning	3·9	4·70	4·46	4·41	4·17
" " evening	4·1	4·27	4·41	4·51	4·55
" " whole day	4·0	4·49	4·43	4 46	4·36
Yield of butter fat	0·960 lbs.	1·055 lbs.	0·923 lbs.	0·903 lbs.	0·889 lbs.

RUBY—GUERNSEY.

Per cent fat morning	4·5	5·75	6·27	5·68	5·45
" " evening	4·9	5·65	6·20	6·35	6·26
" " whole day	4·7	5·70	6·24	6·01	5·85
Yield of butter fat	0·654 lbs.	0·627 lbs.	0·664 lbs.	0·578 lbs.	0·608 lbs.

THERESA—QUEBEC JERSEY GRADE.

Per cent fat morning	3·5	3·70	4·83	4·57	4·46
" " evening	3·9	4·36	4·70	4·82	4·71
" " whole day	3·7	4·03	4·76	4·69	4·58
Yield of butter fat	0·662 lbs.	0·585 lbs.	0.576 lbs.	0·672 lbs.	0·616 lbs.

A study of the above records would indicate :

1. That the percentage of butter fat in the milk, from morning or evening milking, is influenced by the comparative length of interval between the milking hours.

2. The richer milk is found to be produced after the shorter interval.

3. Where intervals between milkings are equal, no appreciable difference appears to exist in either the quality or quantity of the milk drawn in the morning or in the evening.

4. Periods of change in hours of milking are evidently periods of excitement and affect individuals differently.

STEER EXPERIMENTS.

The experiments with steers during the year have been along the line of determining the comparative economy (1), of feeding dehorned steers loose as contrasted with feeding dehorned steers tied, and feeding steers not dehorned tied ; (2) of feeding yearlings, two-year olds, or three-year olds ; (3) feeding steer calves a limited or growing ration, or feeding them a heavy or fattening ration.

The data secured in the loose versus tied experiment do not agree with results of similar work conducted elsewhere. The conditions in the case of the lot fed loose were possibly not so favourable as in the case of the lots fed tied. The temperature was on the average 10 or 12 degrees lower in the case of the lot fed loose. Nine steers were in each lot. It is possible that had there been fewer steers in the lots different results would have been observed. Ample space was allowed at the feed troughs for all, but the stronger steers made relatively greater gains than those of a quieter or more timid disposition. To test the relative economy of feeding a small or a large number together, there are being fed here at present lots of 9, 6 and 3 steers each. Exactly the same floor space is allowed per steer in each lot, namely, 62 square feet.

The rations fed the different lots were, of course, similar. The grain or meal was exactly the same per lot, whether tied or loose. The roughage, or at least the mixture of roots, ensilage, chaff and hay being limited only by the appetite of the lots. The lot fed loose ate much more of this than the lots fed tied. The exercise possible in the pen where they were fed was quite insufficient to account for this, nor would the difference in temperature mentioned above, for the greatest differences in the amounts of roughage consumed were observed when the temperatures were similar in March, April and part of May.

FEEDING STEERS.

No experiments with feeding stuffs have been conducted during the year. In November, 1899, there were put up to feed 77 steers. These cost in the stables, $2,464. The total cost to feed them was $966.85, making a gross cost of $3,430.85. They sold for $3,773,14, leaving a net profit of $342.29. The average net profit per steer was $4.44.

In estimating the cost of feeding, the following prices were charged:—

	Per ton.
Clover hay	$5 00
Straw	3 00
Ensilage	2 00
Roots, 6 cents per bushel or	2 00
Corn	16 00
Oats, pease or barley	19 00
Bran	15 00
Oil meal	35 00

The steers were fed twice a day, morning and night. A mixture of roots (as long as roots lasted), ensilage, straw and meal being given first each meal, followed by a light feed of long hay. For the first few weeks no grain or meal was fed, and later the grain ration grew gradually till about six pounds per diem was being fed. A somewhat different plan was followed in the case of the yearlings, however, which received no grain till April.

The meal ration consisted of half corn, half oats, pease, barley and bran, equal parts. About six weeks before selling, an addition of a small amount of oil meal was made to this ration, starting with one-third pound per diem, and going up to one and a half pounds.

Below are statements of the results in some of the different lots :—

STATEMENT of weights and gains of Steers in Tied vs. Loose Experiment.

Lot I.—Dehorned, Tied.—9 Steers.

First weight	pounds	8,655
Finished weight	"	10,905
Total gain in 184 days	"	2,250
Daily gain per steer	"	1·36
Gross cost of feed		$133.17
Cost of 1 pound gain	cents	5·9

Lot II.—Dehorned, Loose.—9 Steers.

First weight	pounds	8,650
Finished weight	"	10,805
Total gain in 184 days	"	2,155
Daily gain per steer	"	1·30
Gross cost of feed		$140.58
Cost of 1 pound gain	cents	6·5

Lot III.—Not Dehorned, Tied.—9 Steers.

First weight	pounds	8,635
Finished weight	"	11,074
Total gain in 181 days	"	2,439
Daily gain per steer	"	1·49
Gross cost of feed		$151.78
Cost of 1 pound gain		6·2

STATEMENT of particulars in comparative feeding of Yearlings, Two-year-olds a Three-year-olds:

Yearlings.

Number of steers in lot		9
First weight	pounds	7,275
Finished weight	"	9,193
Total gain in 192 days	"	1,918
Total gain per steer (average)	"	213·1
Daily gain per steer	"	1·11
Gross cost of feed		$95.87
Cost of 1 pound gain		0 05
Cost of steers, 7,275 pounds at $3.25 per cwt.		$236 33
Total cost to produce beef, $236.33 + $95.87		332 20
Sold 9,193 pounds at $4.50 per cwt.		413 68
Profit on lot		81 48
Net profit per steer		9 05

Two-year-olds.

Number of steers in lot		9
First weight	pounds	8,635
Finished weight	"	11,074
Total gain in 181 days	"	2,439
Total gain per steer (average)	"	271
Daily gain per steer	"	1·49
Gross cost of feed		$151 78
Cost of 1 pound gain	cents	6·2
Cost of steers, 8,635 pounds at $3.50 per cwt		$302 22
Total cost to produce beef, $302.22 + $151.78		454 00
Sold 11,074 pounds at $4.65 per cwt		514 94
Profit on lot		60 94
Net profit per steer		6 77

Three-year-olds.

Number of steers in lot		9
First weight	pounds	10,065
Finished weight	"	12,655
Total gain in 188 days	"	2,590
Total gain per steer (average)	"	287
Daily gain per steer	"	1·53
Gross cost of feed		$176.27
Cost of 1 pound gain	cents	6·8
Cost of steers, 10,065 pounds at $3.75 per cwt		$377 81
Total cost to produce beef, $377.81 + $176.27		554 08
Sold 12,655 pounds at $4.75 per cwt		601 11
Profit on lot		47 03
Net profit per steer		5 22

STEER CALF EXPERIMENT.

In the early part of May, 10 bull calves of at least three fourths Shorthorn blood were purchased and castrated. They were from ten days to a month old. The fact of their not having been castrated at an earlier age was somewhat against them.

On May 12 they were divided into two groups of five steers each.

Lot I was fed a limited growing ration.

Lot II was fed a full fattening ration from the start, by full fattening ration being meant, of course, one suited to growing stock.

A study of the subjoined synopses of the feeder's records will show the exact differences between the two rations.

In estimating cost of feeding calves the following values were placed on the various feeds used:—

Clover hay	25 cents per cwt.	Bran.	$0 75 per cwt.
Roots and ensilage.	10 " "	Oilmeal.	1 75 per cwt.
Corn.	80 " "	Bibby's cream.	
Oats, pease or barley.	95 " "	Equivalent.	3 50 per cwt.
		Skim milk.	15 "

Lot I—Limited Growing Ration.

1900 Week Ending.	Skim Milk.	Oats.	Corn.	Oil Meal.	Barley.	Bran.	Shorts.	Peas.	Roots.	Ensilage.	Straw.	Hay.
May, 19	525	8¾	....	....	....	....	....	....	....	35	....	17½
" 26	525	8¾	....	....	....	....	....	....	....	35	....	17½
June, 2	525	8¾	....	....	....	....	....	....	....	35	....	17½
" 9	525	8¾	....	....	....	....	....	....	....	35	....	17½
" 16	525	8¾	....	....	....	....	17½	....	....	....	....	35
" 23	525	8¾	....	....	....	....	17½	....	....	....	....	35
" 30	525	17½	....	....	....	8¾	17½	....	....	....	....	35
July, 7	350	17½	....	....	....	8¾	17½	....	....	....	....	35
Total for 8 weeks	4025	87½	....	....	....	17½	70·0	....	....	140·0	....	210·0
July, 14	350	17½	....	....	....	8¾	17½	....	....	....	....	35
" 21	350	17½	....	....	....	8¾	17½	....	....	....	....	35
" 28	350	17½	....	....	....	17½	17½	....	....	....	....	35
Augt. 4	350	24½	....	....	....	17½	17½	....	....	....	....	70
" 11	350	24½	....	....	....	17½	17½	....	....	....	....	70
" 18	350	24½	....	....	....	24½	24½	....	....	....	....	70
" 25	350	24½	....	....	....	24½	24½	....	....	....	....	70
Sept. 1	350	24½	....	....	....	24½	24½	....	....	....	....	70
Total for 8 weeks	2800	175·0	....	....	....	143½	161·0	....	....	....	....	455·0
Sept. 8	350	24½	....	....	....	24½	24½	....	....	....	....	70
" 15	350	26¼	....	....	....	26¼	26¼	....	....	....	....	70
" 22	....	26¼	....	....	....	26¼	26¼	....	....	....	....	70
" 29	....	35	....	....	....	35	26¼	....	....	....	....	70
Oct. 6	....	35	....	....	....	35	26¼	....	....	....	....	70
" 13	....	35	....	....	....	35	35	....	....	....	....	70
" 20	....	35	....	....	....	35	35	....	....	....	....	70
" 27	....	35	....	....	....	17½	17½	....	....	....	....	70
Total for 8 weeks	700	252	....	....	....	234½	217	....	....	....	....	560
Nov. 3	....	35	....	....	....	35	....	....	....	70	....	Pasture
" 10	....	35	....	....	....	36	....	....	....	70	....	Pasture
" 17	....	35	....	....	....	17½	17½	....	....	70	....	35
" 24	....	35	....	....	17½	35	17½	....	70	35	....	35
Dec. 1	....	35	....	....	17½	35	17½	....	70	35	....	35
Total for 4 weeks	....	175	....	....	35	157½	52½	....	140	280	....	105

Lot II—Full Fattening Ration.

1900. Week Ending.	Skim milk.	Oats.	Corn.	Oil meal.	Barley.	Bran.	Shorts.	Peas.	Roots.	Ensilage.	Straw.	Hay.
May, 19	525	$8\frac{3}{4}$	$2\frac{3}{16}$	$2\frac{3}{16}$	...	...	...	...	...	35	...	$17\frac{1}{2}$
" 26	525	$8\frac{3}{4}$	$2\frac{3}{16}$	$2\frac{3}{16}$	...	...	...	...	...	35	...	$17\frac{1}{2}$
June, 2	525	$8\frac{3}{4}$	$2\frac{3}{16}$	$2\frac{3}{16}$	...	...	...	...	...	35	...	$17\frac{1}{2}$
" 9	525	$8\frac{3}{4}$	$2\frac{3}{16}$	$2\frac{3}{16}$	...	...	...	...	...	35	...	$17\frac{1}{2}$
" 16	525	$8\frac{3}{4}$	$2\frac{3}{16}$	$2\frac{3}{16}$	...	...	...	...	...	...	...	35
" 23	525	$8\frac{3}{4}$	$2\frac{3}{16}$	$2\frac{3}{16}$	...	$4\frac{6}{16}$	...	...	...	...	...	35
" 30	525	$17\frac{1}{2}$	$4\frac{6}{16}$	$4\frac{6}{16}$	...	$4\frac{6}{16}$	...	...	...	...	...	35
July, 7	350	$17\frac{1}{2}$	$4\frac{6}{16}$	$4\frac{6}{16}$	...	$4\frac{6}{16}$	...	...	...	...	...	35
Total for 8 weeks	4,025	$87\frac{1}{2}$	$21\frac{14}{16}$	$21\frac{14}{16}$	...	$13\frac{2}{16}$	...	...	...	140	...	210
July, 14	350	$17\frac{1}{2}$	$4\frac{6}{16}$	$4\frac{6}{16}$	...	$4\frac{6}{16}$	...	...	...	...	...	35
" 21	350	$17\frac{1}{2}$	$4\frac{6}{16}$	$4\frac{6}{16}$	...	$4\frac{6}{16}$	...	...	...	...	...	35
" 28	350	$17\frac{1}{2}$	$4\frac{6}{16}$	$4\frac{9}{16}$	...	$17\frac{1}{2}$	...	...	...	...	...	35
Aug. 4	350	$24\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 11	350	$24\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 18	350	$24\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 25	350	$24\frac{1}{2}$	$6\frac{9}{16}$	$10\frac{1}{2}$	...	$24\frac{1}{2}$	...	...	...	...	...	70
Sept. 1	350	$24\frac{1}{2}$	$6\frac{9}{16}$	$10\frac{1}{2}$	...	$24\frac{1}{2}$	...	...	...	...	...	70
Total for 8 weeks	2,800	175	$49\frac{14}{16}$	$57\frac{3}{4}$	...	$127\frac{3}{4}$	...	...	...	...	...	455
Sept. 8	350	$24\frac{1}{2}$	$6\frac{9}{16}$	$10\frac{1}{2}$	...	$24\frac{1}{2}$	...	...	...	...	...	70
" 15	350	$17\frac{1}{2}$	$8\frac{3}{4}$	$10\frac{1}{2}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 22	...	$26\frac{1}{4}$	$8\frac{3}{4}$	$12\frac{1}{4}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 29	...	$26\frac{1}{4}$	$8\frac{3}{4}$	$12\frac{1}{4}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
Oct. 6	...	35	$12\frac{1}{4}$	$12\frac{1}{4}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 13	...	35	$12\frac{1}{4}$	$12\frac{1}{4}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 20	...	35	$26\frac{1}{4}$	$12\frac{1}{4}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
" 27	...	35	$26\frac{1}{4}$	$19\frac{1}{4}$	...	$17\frac{1}{2}$	...	...	...	...	...	70
Total for 8 weeks	700	$234\frac{1}{2}$	$109\frac{13}{16}$	$101\frac{1}{2}$	...	147	...	...	...	...	...	560
Nov. 3	...	35	35	...	...	$17\frac{1}{2}$	...	...	...	70	...	Pasture
" 10	...	35	35	...	...	$17\frac{1}{2}$	...	...	...	70	...	Pasture
" 17	...	35	35	...	...	$17\frac{1}{2}$	...	...	70	35	...	35
" 24	...	35	35	...	...	35	...	...	70	35	...	35
Dec. 1	...	35	35	...	...	35	...	...	105	35	...	35
Total for 4 weeks	...	175	175	...	...	$122\frac{1}{2}$	...	...	245	245	...	105

The following tables contain a synopsis of results observed to December 1, 1900.

LOT I. LIMITED GROWING RATION—FIVE STEERS.

Period.	Total Gain of Lot.	Daily Rate of Gain per Steer.	Cost to Feed Lot.	Cost of 1 Lb. Gain.	Cost to Feed 1 Steer 1 Day.	Remarks.
	Lbs.	Lbs.	$ cts.	cts.	cts.	
First period 8 weeks	299	1·30	8 25	2·75	2·94	Lot weighed 595 lbs. May 14, or an average of 119 lbs.
Second "	344	1·11	9 42	2·73	3·36	
Third "	328	1·06	8 43	2·57	3·01	
Fourth 4 weeks	319	2·12	4 29	1·34	3·08	
Aggregate or average	1,290	1·31	30 39	2·35	3·10	Total weight 1,885 lbs. December 1.

LOT II. FULL FATTENING RATION—FIVE STEERS.

Period.	Total Gain of Lot.	Daily Rate of Gain per Steer.	Cost to Feed Lot.	Cost of 1 Lb. Gain.	Cost to Feed 1 Steer 1 Day.	Remarks.
	Lbs.	Lbs.	$ cts.	cts.	cts.	
First period 8 weeks....	310	1·35	8 18	2·63	2·90	Lot weighed 751 lbs. May 14, or an average of 150 lbs.
Second "	373	1·20	9 37	2·51	3·34	
Third " ...	418	1·37	8 44	2·01	3·01	
Fourth period 4 weeks...	313	2·08	6 85	2·19	4·89	
Aggregate or average....	1,414	1·44	32 84	2·32	3·35	Total weight 2,165 lbs. December 1.

PIGS.

At present the stock of breeding pigs consists of the following pure bred animals :

Improved Large Yorkshires..	1 boar..	9 months.
	2 sows..	1 year.
	3 sows..	9 months.
Improved Berkshires........	1 boar..	2½ years.
	2 sows..	9 months.
Tamworths................	1 boar	2 years.
	1 sow..	15 months.
	1 sow..	6 months.

There are besides a number of young Yorkshires and Tamworths about three months old.

The 'soft' pork investigations are being continued, a full report of which will be published at a later date.

Economy of Pork Production.

A number of pigs have been fed upon artichokes (see page 94) on rape, (see page 92) on pumpkins, raw and cooked; (see page 93) on clover pasture, on steamed clover, on mangels, on grain alone, on grain and milk, on grain alone, fed three times a day, and on similar grain fed from a self-feeder.

The following statements will indicate the comparative economy of the various rations or methods of feeding :—

Statement A.

Lot of 5 pigs on clover pasture and grain—

To 5 pigs, average weight 90 pounds, at $5.50 each........	$ 27 50
½ acre clover pasture (see page for value)..	4 50
1,600 pounds meal at 90 cents..	14 40
Total..	$ 46 40
By 900 pounds pork at $6 per cwt..	$ 54 00
Profit on lot..	7 60
Profit per pig..	1 52
Cost to produce 100 pounds pork..	4 20

Statement B.

Lot of 6 pigs on steamed clover and grain—

To 6 pigs, average weight 73 pounds, at $4.50 each	$ 27 00
¾ tons clover at $5	3 75
1,475 pounds meal at 90 cents	13 27
Total	$ 44 02
By 1,085 pounds pork at $6 per cwt	$ 65 10
Profit on lot	21 08
Profit per pig	3 51
Cost to produce 100 pounds pork	2 63

Statement C.

Lot of 6 pigs on mangels and grain—

To 6 pigs, average weight 73 pounds, at $4.50 each	$ 27 00
6,200 pounds mangels at $2 per ton	6 20
1,350 pounds grain at 90 cents per cwt	12 15
Total cost	$ 45 35
By 1,112 pounds pork at $6 per cwt	$ 66 72
Profit on lot	21 37
Profit per pig	3 56
Cost to produce 100 pounds pork	2 87

Statement D.

Lot of 6 pigs fed on grain alone—

To 6 pigs, average weight 73 pounds, at $4.50 each	$ 27 00
2,123 pounds grain at 90 cents per cwt	19 11
Total cost	$ 46 11
By 1,068 pounds poɪk at $6 per cwt	$ 64 08
Profit on lot	17 97
Profit per pig	2 99
Cost to produce 100 pounds pork	3 03

Statement E.

Lot of 6 pigs fed on grain and milk—

To 6 pigs, average weight 43 pounds, at $3 each	$ 18 00
1,340 pounds skim milk at 15 cents per cwt	2 01
2,003 pounds meal at 90 cents per cwt	18 03
Total cost	$ 38 04
By 1,152 pounds pork at $6 per cwt	$ 71 12
Profit on lot	33 08
Profit per pig	5 51
Cost to produce 100 pounds pork	2 24

Statement F.

Lot of 5 pigs fed grain only three times a day—

To 5 pigs, average 120 pounds, at $7.50 each	$ 37 50
1,289 pounds meal at 90 cents per cwt.	11 60
Total cost	$ 49 10
By 953 pounds pork at $6 per cwt.	$ 55 18
Profit on lot	6 08
Profit per pig	1 21
Cost to produce 100 pounds pork	3 28

Statement G.

Lot of 5 pigs on self-feeder—

To 5 pigs, average weight 98 pounds, at $6.00 each	$ 30 00
1,907 pounds grain at 90 cents	17 16
Total cost	$ 47 16
By 958 pounds pork at $6 per cwt	$ 57 48
Profit on lot	10 32
Profit per pig	2 06
Cost to produce 100 pounds pork	3 57

In the foregoing statements a uniform selling price has been used to permit of comparison of profits. The actual selling prices were as follows :—A, $6 per cwt.; B, $5.25 per cwt.; C, $5.25 per cwt.; D, $5.25 per cwt.; E, $6.25 per cwt.; F, $6 per cwt.; G, $6 per cwt.

The differences in prices are due to the then state of the market, and so should not be considered in making a comparison of profits.

The meal fed in every case consisted of one-half corn, one-half oats, pease and barley, equal parts. This was worth on the markets sometimes 95 cents per cwt., at other times 85 cents per cwt., so an average price of 90 cents per cwt. has been charged.

The question of age enters into the relative profits as well as into the relative costs of producing 100 pounds gain. The pigs in A, F and G were considerably older than in the other lots, and so the greater cost of gain must in some measure be attributed to this fact.

SHEEP.

The flocks on the Central Experimental Farm are kept to use to the best advantage a bit of stony land and to carry on some experimental work in breeding and feeding.

THE FLOCKS.

The flocks consist of: Leicesters, 1 ram and 7 ewes; Shropshires, 1 ram and 8 ewes; grades, 6 bred to Leicester ram and 3 bred to Shropshire ram.

A very good lamb crop came in the spring, an average of 1⅔ lambs to breeding ewe. The lambs did not do as well at first as was anticipated, the trouble being the small white intestinal worm. Since ridding them of this dangerous pest, however, they have done exceedingly well.

CARE AND MANAGEMENT OF BREEDING EWES.

All too frequently the care and proper management of his flock of breeding ewes receives scant attention from the farmer. He thinks them able to shift for themselves, and, as a result, declares sheep 'no good.' A little care and a very small expenditure of money would frequently change this verdict and leave a nice balance in favour of the smallest as well as the larger flocks.

Accordingly, a few suggestions as to the care of breeding ewes are offered.

In the Autumn.

In the autumn, just prior to the mating season, the ewe should be given fresh pasture or a small feed of grain to start her gaining in flesh. This should be kept up through the mating season and may be expected to show up in results at lambing time with an increased percentage of lambs.

As the housing time draws near, see that the fold is in good condition, that is, clean and free from holes likely to cause draughts. A cool, well-ventilated, clean pen means good, healthy sheep and sturdy lambs. While shelter and cleanliness, with pure, cool air, are essential, exercise is imperative, if a good lamb crop is to be hoped for. Of course, mild exercise is understood.

The winter ration should consist largely of roots (turnips) and clover hay or pea straw. Ensilage has been fed with great success. As lambing time draws on, less roots should be fed. The milking ewe needs a considerable addition to the roughage ration and mangels, with clover or pea straw and some shorts or bran and crushed oats, suit her well.

An excellent supplementary food in summer is afforded by rape. This is especially good for lambs. They may be allowed to nibble it at will, having other pasture to run on at the same time.

FARM CROPS.

The rotation mentioned in the report for 1899 is being followed. The following crops have been grown during this year:—

OATS.

Five varieties of oats were grown, namely, Banner, Improved, Ligowo, Golden Beauty, American Beauty and Siberian. They were sown on land that had been in roots, corn or potatoes the preceding year. In the autumn after the above-mentioned crops had been harvested, the land was ribbed, as is done in sowing turnips or mangels, and left lying so till the spring, when it was broken down and sown. The particulars of the varieties grown are as follows :—

Golden Beauty.—4¼ acres, sown May 2, 1¾ bushels per acre, matured in 103 days, August 13. Yielded 48 bushels per acre. Measured bushel weighed 40½ pounds.

Siberian.—6½ acres, sown May 3, 1¾ bushels per acre, matured in 105 days, August 16. Yielded 54¼ bushels per acre. Measured bushel weighed 42 pounds.

American Beauty.—4½ acres, sown May 2, matured in 103 days, August 13. Yielded 47½ bushels per acre. Measured bushel weighed 40 pounds.

Improved Ligowo.—8¾ acres, sown April 28, 1¾ bushels per acre, matured in 98 days, August 4. Yielded 50⅝ bushels per acre. Measured bushel weighed 42½ pounds.

Banner.—12 acres, sown April 30, 2 bushels per acre, matured in 100 days, August 8. Yielded 60⅓ bushels per acre. Measured bushel weighed 40 pounds.

Below is a statement of cost of growing this lot of oats, with an estimate of the cost of providing digestible dry matter through this crop:—

Cost of growing 12 acres oats—

Rent of land, at $3 per acre	$36 00
Ribbing in autumn, 3 days at $2.50	7 50
Cultivating in spring twice, 3½ days at $2.50	8 75
⅓ manure, at rate of 15 tons per acre, $1 per ton, applied in root year	36 00
Harrowing in spring, at 20c	2 40
Seed, 24 bushels at 50 cts	13 00
Sowing, 1 2-10 days at $2.50	3 00
Rolling, 7-10 days at $2.50	1 75
Cutting with binder, 1 4-10 days at $2.50	3 50
Twine, $4.80 : use of binder, $5	9 80
Shocking and cutting with scythes, 4 men, 1½ days at $1.25	7 50
Loading and unloading, 6 men, 1 day	7 50
Drawing in, 2 teams, 1 day at $2.50	5 00
Threshing, at 2½ cents per bushel, 724 bushels	18 10
Yield, 20 tons straw and 24,616 pounds, or 724 bushels, grain.	$159 80

Cost to produce 1 ton grain	$9 21
Cost to produce 1 bushel grain	15⅔ cts.
Cost to produce 1 ton straw	$2 32
Cost to produce 100 pounds digestible dry matter, grain	73 cts.
Cost to produce 100 pounds digestible dry matter, straw	27 cts.

BARLEY.

Mensury.—5 acres were sown on what had been corn and sorghum land the preceding year. Sown May 2, matured in 92 days, August 2. Yielding 40 bushels, 38 pounds per acre. Measured bushel weighed 52 pounds.

Cost of growing 5 acres barley—

Rent of land, at $3 per acre	$15 00
Ribbing in autumn, 1¼ days at $2.50	3 16
Cultivating in spring twice, 1¼ days at $2.50	3 16
⅓ manure, at rate of 15 tons per acre, at $1 per ton	15 00
Seed, 9¾ bushels, at 50 cents per bushel	4 87½
Sowing, ½ day at $2.50	1 25
Rolling, 2½ hours, at 25 cents	0 63
Cutting with binder, ½ day	1 25
Twine, $2 ; use of binder, $2	4 00
Shocking, 2 men, ½ day	1 25
Hauling, 1 team and 4 men, 1 day	8 50
Threshing, 204 bushels, at 3½ cents per bushel	7 14
Yield, 90 tons straw, and 9,790 pounds, or 204 bushels, grain.	$65 22

Cost to produce 1 ton grain	$10 07
Cost to produce 1 bushel grain	24·1 cts.
Cost to produce 1 ton straw	$1 83
Cost to produce 100 pounds digestible dry matter, grain	65·8 cts.
Cost to produce 100 pounds digestible dry matter, straw	20 cts.

PEASE.

Prussian Blue.—8 acres. This crop was grown on land that had been pastured for two years. It had been broken up early the preceding autumn. The seeding was done May 11, and the crop matured in 108 days, August 27. The growth of straw was heavy, but grain light, yielding 18¼ bushels per acre. Measured bushel weighed 63 lbs.

Cost of Growing 8 Acres of Pease.

Rent of land at $3 per acre	$24 00
⅓ manure, 15 tons to acre at $1	24 00
Ploughing in autumn at $2 per acre	16 00
Harrowing and cultivating in spring	7 50
Seed, 16 bushels at 80c	12 80
Cutting 1 day, team and 2 men	5 00
Drawing in, 2 teams and 4 men, 1 day	11 00
Threshing at 2½ cents per bushel, 147 bushels	3 68
Total	$103 98

Yield : 147 bushels grain or 8,820 pounds, and 20 tons straw.

Cost to produce 1 ton grain	$15 70
Cost to produce 1 bushel grain	47·1
Cost to produce 1 ton straw	1 73
Cost to produce 100 lbs. digestible dry matter, grain	90·2
Cost to produce 100 lbs. digestible dry matter, straw	21

MIXED CROP EXPERIMENT.

Side by side on the first year of the rotation field, that is on what had been pasture the preceding year, were sown 8 plots of 2 acres each, the aim being to get some data as to the comparative yields of crops grown as mixtures and as pure grains.

	Pounds of grain.
Plot 1, pure pease, yielded	2,202
Plot 2, pure barley, yielded	2,504
Plot 3, pure oats, yielded	4,119
Plot 4, mixture, barley 1 bushel, oats 1 bushel, pease 1 bushel, yielded	3,117
Plot 5, mixture, pease 1 bushel, oats 2 bushels, yielded	2,493
Plot 6, mixture, oats 1½ bushels, barley 1 bushel, yielded	2,915
Plot 7, mixture, wheat ½ bushel, barley ¾ bushel, oats 1 bushel, pease ¾ bushel, yielded	3,120
Plot 8, mixture, oats and pease equal parts by weight, yielded	1,341

It would be difficult to put a value on the straw from the various plots. Plot 8 gave a very heavy yield, of coarse long straw. The soil was in this case of a mucky nature.

MILLET.

A plot, 1 acre in area, was sown to domestic millet. The soil, a sandy loam, was rather wet, due to imperfect drainage. It had been in pasture the preceding year. The millet was sown broadcast, and made a fair growth. Sown June 15, it was harvested for hay August 24, and yielded 1 ton 920 pounds of dry fodder. After harvesting it made a fair growth on the stubble, but not sufficient to warrant cutting again.

MIXED HAY.

The hay crop was only fair this year, the total amount harvested being 140 tons. Below is a statement of the cost of growing 32 acres mixed hay :—

Rent of land at $3 per acre..................................	$96 00
⅕ manure at 15 tons per acre, $1 per ton................	96 00
½ seed at $1.50 per acre, 10 lbs. clover, 12 lbs. timothy....	24 00
4 days' cutting at $2.50..................................	10 00
2 days' teddering at $1.75..............................	3 50
3 days' raking at $1.75..................................	5 25
Rent of machines, oil, etc..............................	4 00
Cocking 6 days at $1.25..................................	7 50
Hauling in, 4 teams and 8 men, 1 day..................	20 00
	$266 25

Yield : 60 tons.

Cost to produce 1 ton hay..................................	$ 4 45
Cost to produce 100 lbs. digestible dry matter............	43·6

Clover Hay.

Cost to grow 7 acres clover :—

Rent of land at $3..	$21 00
⅕ manure, 15 tons to acre, $1 per ton....................	21 00
½ seed, at $1.50 per acre, 10 lbs. clover, 12 lbs. timothy......	5 25
1¼ days' cutting at $2.50..................................	3 12
½ day teddering at $1.75..................................	87
¾ day raking at $1.75......................................	1 31
Rent of machines, etc......................................	1 00
Cocking, 2 days at $1.25..................................	2 50
Hauling, 3 teams and 4 men, ½day..........................	6 25
	$62 30

Yield : 20 tons.

Cost to produce 1 ton......................................	$3 12
Cost to produce 100 lbs. digestible dry matter............	30·6

SORGHUM OR SUGAR CANE.

Sugar cane, Early Amber, 1 acre. The soil was sandy, of fair quality and received a dressing of barn-yard manure in the spring of 1895 of about 15 tons per acre. No fertilizer had been applied subsequently. The previous year it had been in pasture. The land was ploughed early in the autumn of 1899 about 4 inches deep, harrowed several times to keep down all growth, and cultivated the following spring and harrowed with the smoothing harrows before sowing. Sown June 16, with a force-feed seed-drill, in rows 3 feet apart; came up June 28.

The growth was very slow during July, owing to the large amount of rain. In August the crop made great progress, and stood about 10 feet high early in September. It was then cut and fed to dairy cattle and steers.

It is very seldom a good crop of sorghum is harvested in this section, owing to the great rainfall. A fairly dry June and July are essential to success with this grass.

CORN (*ZEA MAYS*).

Ten varieties were sown in areas ranging from ½ to 8½ acres, the aggregate being 30 acres.

Corn constituting part of the second year of the rotation, the soil was gang-ploughed the preceding autumn, a fair growth of clover being turned down, save where pease had been grown. Manure, at the rate of about 15 tons to the acre, was hauled out in the winter, left in small heaps and scattered as the frost was leaving the ground. The whole area was cultivated as frequently as weather would permit, until time to seed.

The sowing was done with a force drill in rows 42 inches apart.

The following particulars about the different varieties may be of interest:—

King of the Earliest.—2 acres soil, loam. Sown June 6. Cut for ensilage September 24, late dough stage. Yield, 13 tons 1,626 pounds per acre.

Giant Prolific Sweet Ensilage.—2 acres. Sown June 5. Cut for ensilage Septmeber 24. Very few ears. Yield, 16 tons 367 pounds per acre.

Selected Leaming.—4 acres. Sown June 1. Cut for ensilage September 22, late dough stage. Yield, 14 tons 1,325 pounds per acre.

Canada White Flint.—2 acres. Sown June 6. Cut for ensilage September 24, ripening. Yield, 11 tons 585 pounds per acre.

Early Mastodon.—2 acres. Sown June 6. Cut for ensilage September 24, dough stage. Yield, 14 tons 140 pounds per acre. This lot was on low land and was frozen to some extent.

Longfellow.—3 acres. Sown May 30. Cut for ensilage September 22, late dough stage. Yield, 17 tons 851 pounds per acre.

Mammoth Cuban.—3 acres. Sown May 30. Cut for ensilage September 23, dough stage. Yield, 13 tons 1,260 pounds per acre.

Clouds Early.—½ acre. Sown May 30. Cut for ensilage September 22, dough stage. Well eared. Yield, 9 tons 1,412 pounds per acre.

Whitecap Yellow Dent.—3 acres. Sown June 5. Cut for ensilage September 22, well-eared, dough stage. Yield, 10 tons 1,050 pounds per acre.

Selected Leaming.—8½ acres. Sown May 30 and cut September 14, very well-eared, late dough stage. The land on which this variety was grown was better drained than the area occupied by the other varieties, and so we may infer that the crop harvested off this area is representative.

The yield was 20 tons 235 pounds per acre, or 171 tons off the field.

Below is a summary of the cost of producing the finished ensilage from this area.

CORN (*ZEA MAYS*).

Selected Leaming.

Cost of growing 8½ acres of corn:—

Rent of land at $3 per acre	$25 50
Cultivating in autumn 5 days at $2.50	12 50
½ value of manure applied 15 tons at $1	25 50
Ploughing in spring at $2 per acre	17 50

Harrowing twice at 20 cents per acre	$ 3 40
Seed 225 pounds at $1 per hundred	2 25
Sowing, team 1 day $2.50	2 50
Harrowing after sowing (twice) at 20 cents per acre	3 40
Hoeing 17 days at $1.25	21 25
Cultivating with team 6½ days at $2.50	13 75
Cutting with machine 2½ days at $2.50	7 50
Loading and unloading, tramping, cutting 37 days	46 25
Drawing in team 9 days at $2.50	22 50
Man at engine 3 days at $1.50	4 50
Use of engines and fuel and Ensilage cutter 3 days at $5	15 00
Total cost	$213 30

Yielded, 171 tons corn in silo.

Cost $1.25 per ton in silo, or 3·75 cts. per bushel.

Average amount of dry matter per ton 375 lbs., (75 per cent digestible). Cost of producing 100 lbs. digestible dry matter, 44⅔ cts.

MANGELS.

Three varieties of mangels were sown. Sown May 13, harvested October 20.

Gate Post Red.—Two acres, yielded 31 tons 1,295 pounds, or 1,054 bushels 55 pounds per acre.

Giant Yellow Globe.—One acre, yielded 31 tons 1,960 pounds, or 1,066 bushels per acre.

Golden Tankard.—Twelve acres, yielded 30 tons 36 pounds, or 1,000 bushels and 36 pounds per acre.

The dry matter content of the varieties differ materially.

Variety.	Digestible dry matter in 100 lbs.	From 1 acre. lbs.
Gate Post Red	11·14	7,051·62
Giant Yellow Globe	8·19	5,238·87
Golden Tankard	10·25	6,153·43

These varieties were grown on land of a fairly uniform character, therefore difference in composition cannot be attributed to varieties in soil.

Below is cost of growing the above :

MANGELS.

Cost of growing 4½ acres mangels—

Rent of land at $3	$13 50
Cultivating in autumn 4 times	7 50
½ cost of manuring 15 tons per acre at $1 per ton	13 50
Ploughing in spring at $2	9 00
Harrowing twice 7 hours at 25 cents	1 75
Drilling 2 days at $2.50	5 00
Rolling 3 hours	0 75
Seed 13½ pounds at 20 cents	2 70
Sowing 2 days at $1.25	2 50

Hand wheel hoeing 5½ days at $1.25	$ 6 88
Thinning 9 days at $1.25	11 25
Hoeing, 10 days at $1.25	12 50
Cultivating, single horse, 6 days $1.75	10 50
Pulling and topping 11 days	13 75
Drawing team 6 days $2.50	15 00
Loading and unloading 9 days $1.25	11 25
	$137 33

Total yield 143 tons.

Cost of 1 ton mangels housed 96 cts., or 2·88 cts. per bushel.

Average dry matter per ton, 200 lbs. Cost of 100 lbs. digestible dry matter 48 cts.

TURNIPS.

Three varieties were grown with fair success. The soil was inferior to that under mangels inasmuch as it was not well drained. The plants made a uniform growth, but owing to the weather made a relatively greater top than root growth and so did not yield so well as might have been anticipated from looking at them growing.

Two acres sown later and on land better suited for this crop gave a greater yield by about fifty per cent.

Manure was applied during the spring and thoroughly incorporated with the soil. After being well cultivated the soil was drilled into ridges 2 feet apart. These were compacted by means of the land roller and seed-sown at the rate of 3 pounds per acre. The varieties with particulars concerning each are as follows :—

Skirving's Purple Top.—One acre, sown June 16, harvested November 2, roots small, yield, 17 tons 1,590 pounds per acre.

Champion Purple Top.—One acre, sown June 16, harvested November 2, roots rather small, yield, 18 tons 1,039 pounds per acre.

Rennie's Prize Purple Top.—Two acres, sown June 16, harvested November 2, roots small, yield, 17 tons 827 pounds per acre.

Analyses of samples of each variety grown this year, taken when the roots were being harvested show them to be practically equal in dry matter. The average percent of digestible dry matter being 10·49.

The following itemized statement of cost of production may be of interest.

TURNIPS (SWEDES.)

Rent of land at $3	12 00
Cultivating in autumn three times	7 50
½ manure, 15 tons per acre, valued at $1 per ton	12 00
Ploughing in spring at $2	8 00
Harrowing twice	1 62
Drilling 1 7-10 days at $2.50	4 25
Rolling 2½ hours	63
Seed, 12 pounds at 20 cents	2 40
Sowing, 16 hours at 12½ cents	2 00
Hand-wheel hoeing, 3 3-10 days	4 13
Thinning, 8 days at $1.25	10 00
Hoeing once, 6 days	7 50
Cultivating, single horse, 5 days at $1.75	8 75
Pulling and topping, 10 days at $1.25	12 50
Drawing, team 4 days at $2.50	10 00
Loading and unloading, 9 days	11 25
	$114 53

1. Corn Harvester at work.
2. Group of Steers for feeding.
3. Cutting ensilage and filling silo with blower
4. Harvesting Banner Oats.

Total crop, 71 tons. One ton cost in root-house $1.63, or 4·89 cents per bushel. Cost of producing 100 pounds digestible dry matter, 77 cents.

CARROTS.

Three varieties of carrots were grown in half-acre lots side by side. The land was cultivated the previous autumn, ploughed in the spring and manured at the rate of 15 tons per acre. Particulars of the varieties are as follows:—

Mammoth White Intermediate.—½ acre. Sown May 16, harvested October 25. Yielded 27 tons 1,930 pounds or 932⅛ bushels per acre.

Improved Short White.—½ acre. Sown May 16, harvested October 25. Yielded 27 tons 1,160 pounds or 919⅓ bushels per acre.

Guerande or Ox Heart (Red).—½ acre. Sown May 16, harvested October 25. Yielded 24 tons 1,520 pounds or 825⅓ bushels per acre.

The white varieties gave the larger returns. The red contain more dry matter or food per ton, but do not keep so well. The white varieties give about 169·2 pounds digestible dry matter to the ton, while the red give about 233·0 pounds to the same quantity of roots.

Below is a statement of the cost of producing carrots.

Cost of Growing One and One-half Acres of Carrots.

Rent of land, 1½ acres, at $3	$4 50
Cultivating in autumn 4 times	2 25
Ploughing in spring at $2	3 00
⅓ manure, at 15 tons per acre, $1 per ton	4 50
Harrowing twice, 2½ hours at 25 cents	62½
Drilling, 5 hours at 25 cents	1 25
Rolling, 1 hour	25
Seed, 4½ pounds at 45 cents	2 02
Sowing, 5 hours at $1.25 per diem	63
Hand-wheel hoeing twice, at $1.25	2 50
Thinning, 5½ days at $1.25	6 88
Hoeing once, 2 days at $1.25	2 50
Cultivating single horse 4 times, 16 hours at 17½ cents	2 80
Ploughing team, 5 hours at $2.50	1 25
Pulling, topping and loading, 12 days at $1.25	15 00
Drawing in and unloading, 2 days at $2.50	5 00
	$54 95

Yield, 40 tons carrots. Cost, $1.37 per ton housed, or 4·11 cents per bushel.

Average dry matter per ton, 200 pounds. Cost of 100 pounds digestible dry matter, 68 cents.

SUGAR BEETS.

Two plots of sugar beets were grown. Vilmorin's White Improved was the variety selected.

To gain some information as to the comparative economy of growing sugar beets or mangels for feed, and to ascertain the relative cost of growing a given area (1) as for forage, (2) as for sugar, two plots of one-quarter acre each were grown side by side. The ground was prepared as for other root crops, and the same amount of barn-

yard manure was applied. In thinning for forage, plants were left 8 inches apart, but for sugar, 4 inches apart. The hoeing, cultivating, &c., of the two plots was the same for some time, but when a fair growth had been made, that is, when the plants were about two months old, those intended for forage were treated as mangels, that is, the upper part of the root left exposed, while those intended for sugar were hilled up, the whole root and crown thereof being covered.

Th yield per acre was nearly the same from the two plots, being at the rate of 21 tons 640 pounds from the forage and 20 tons 1,060 pounds from the sugar plot.

The digestible dry matter content of the roots from the two plots differed materially, namely, 22·50 pounds of dry matter in 100 pounds of roots in the case of roots intended for sugar, and 18·74 pounds of dry matter in 100 pounds of roots intended for forage.

Below is the cost of producing sugar beets (*a*) for sugar (*b*) for forage :—

(*a*).—BEETS (FOR SUGAR.)

Cost of growing one-quarter acre sugar beets for sugar—

Rent of land, at $3	$0 75
Cultivating in autumn	0 37½
¼ manure, at 15 tons per acre, valued at $1 per ton	0 75
Ploughing in spring	0 50
Harrowing	0 10
Drilling	0 33
Rolling	0 05
Seed, 3 pounds at 20 cents	0 60
Sowing, 1 hour	0 12½
Hand-wheel hoeing, 2½ hours	0 33
Thinning, 11 hours	1 38
Hoeing, 7 hours	0 87½
Cultivating, single horse	1 05
Ploughing out roots, 1 hour at 25 cents	0 25
Pulling and topping, 12 hours at 12½ cents	1 50
Drawing in roots, 3 hours	0 75
Loading and unloading, 10 hours	1 25
	$10.96½

Yield on one-quarter acre, 10,265 pounds.

Cost of producing 1 ton	$2 14
Cost of producing 1 bushel	6·42 cts.

Digestible dry matter in 1 ton, 450 pounds.

Cost of 100 pounds of digestible dry matter	48 cts.

(*b*.)—BEETS (FOR FEED.)

Cost of growing one-quarter acre sugar beets for feed—

Rent of land, at $3	$0 75
Cultivating in autumn	0 37½
¼ manure, at 15 tons per acre, valued at $1 per ton	0 75
Ploughing in spring	0 50
Harrowing	0 10
Drilling	0 33

Rolling	$0 05
Seed, 3 pounds at 20 cents	0 60
Sowing, 1 hour	0 12½
Hand-wheel hoeing, 2½ hours	0 33
Thinning, 9 hours	1 13
Hoeing, 6 hours	0 75
Cultivating, single horse, 6 hours at 17½ cents	1 05
Ploughing out roots, 1 hour	0 25
Pulling and topping, 10 hours	1 25
Drawing in roots, 2½ hours	0 63
Loading and unloading, 8 hours	1 00
	$9 97

Yield on one-quarter acre, 10,660 pounds.

Cost of producing 1 ton	$1 87
Cost of producing 1 bushel	5·61 cts.

Digestible dry matter in 1 ton, 375 pounds.

Cost of 100 pounds of digestible dry matter	50 cts.

RAPE (*Brassica Napus*).

As the question of cheap pork production assumes greater proportions in view of our rapidly growing bacon trade, forage plants peculiarly suited for pigs must certainly come to the front. It is well known that the pig thrives on grass or green feed alone, but the importance and necessity of feeding him on such is very often overlooked. Another consideration frequently neglected is the comparative value of different forage plants for the end in view. The conditions governing the feeding operations, however, enter into this matter, and frequently such crops as can be most conveniently produced or utilized must take precedence over others better adapted to the end in view.

Of the various crops more or less extensively cultivated for pig feed during the past two years, none other has given quite such satisfactory results as rape. The variety best suited for forage is Dwarf Essex.

During the past year about 4½ acres have been under rape. The plots have been cultivated as follows:—

Plot 1.—This plot, 1½ acres in extent, was a slightly loamy sand. It was manured 15 tons to the acre in May, and the rape sown in drills 30 inches apart on May 19. This crop grew very rapidly and yielded in August 28 tons green fodder to the acre. A second crop grew up and gave about 3 tons to the acre.

Plot 2.—This plot, 1¼ acres in area, was a good loam. It was manured 12 tons to the acre in June and sown in drills 30 inches apart, June 16. In August it cut 22 tons to the acre, and the land was then ploughed.

Plot 3.—This plot, ¼ acre in area, was sown broadcast on June 18.

The plot had been used as a pig pasture the preceding summer, so no manure was necessary. This plot was used as a pasture for store pigs.

Plot 4.—This plot, three-sixteenths of an acre in area, was sown in drills 30 inches apart. It was used as pasture for pigs.

Plot 5.—This plot, 1½ acres in area, was sown on sod, ploughed July 16. No manure was added, but the best seed bed possible under the circumstances was pre-

pared, and the plot sown July 23 partly in drills 18 inches apart and partly broadcast. The land being rather dirty and in a poor state of tilth, this plot did not do very well. The part sown broadcast was a very light crop indeed. The part sown in drills did very much better, however, as it was possible to cultivate by means of the hand-wheel hoe.

Plots 1 and 2 were cut and used as soiling crops for steers, calves, pigs and sheep. It was impossible to get any idea of the exact feeding value from the animals fed. The steers, ten in number, averaged 1,000 pounds weight and made gains at the rate of 2 pounds per diem each while on the rape, no grain being fed.

A lot of ten steer calves were given a good feed daily and appeared to enjoy the juicy leaves and stems very much, and to thrive thereon.

The pigs to which it was thrown in small quantities daily ate it with avidity, and were quite evidently much benefited by the same.

Sheep were allowed to feed upon lot 5, and ate it down quite close. As soon as turned upon the rape, they began to improve in flesh.

Lambs pastured on a part of lot 1 did well for some time, but did not seem to thrive so well after a few weeks. The rape, however, was not at fault, I think.

The greatest value of the crop would appear to be as a pasture for pigs.

A study of six pigs put to pasture on lot 4, August 14 last, is most interesting. The data obtained is as follows:—

LOT OF SIX PIGS ON RAPE PASTURE.

No. of Pig.	Weights.							
	Aug. 14.	Aug. 28.	Sept. 11.	Sept. 25.	Oct. 9.	Oct. 16.	Oct. 30.	Dec. 6.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
279	61	76	80	85	96	108	129	175
280	60	73	80	95	105	121	147	195
281	64	73	91	103	111	127	150	201
282	60	73	90	99	109	120	143	171
283	60	72	82	99	114	135	157	203
284	53	68	76	90	105	118	141	182
Total	358	435	499	571	640	729	867	1,127
Total gain	......	87	64	72	69	89	138	260
Daily rate of gain in lbs	....	1·03	0·76	0·85	0·82	2·12	1·64	1·20
Daily grain ration	....	1	1½	1¾	2	3	4	5

Statement of cost of proceeds of the above lot of six pigs :—

To 6 pigs at $3	$18 00
3-16 acres rape at $14.17 per acre	2 66
2,067 lbs. meal at 90c. per cwt	18 60
Gross cost	$39 26
By 1,127 lbs. pork at $6 per cwt	$67 62
Profit on lot	28 36
Profit per pig	4 73

From a study of the habits of the pigs pasturing on plot 4, I should say that the best results would be secured by sowing the rape in rows 24 to 30 inches apart at the rate of about 3 pounds of seed (Dwarf Essex) to the acre. When thus sown this can be cultivated by horse-power when young, and has a tendency to branch out and develop a large leaf crop rather than go to stem.

It is most interesting to watch the niceness of discrimination exercised by your practised rape-eating pig, as he strolls leisurely down the row and selects the juicy leaves that best please his fancy. I have observed too, that your trained pig is equal to the best of chemists in picking out those parts of the plant most valuable for food. He soon learns to shun the large or old leaves, and feasts upon the young, the tender, the juicy. A study of the chemistry of the plant will be found in the report of Mr. F. T. Shutt, Chemist of the Experimental Farms.

Below is a statement of the cost of producing the forage :—

Cost of Growing One Acre of Rape.

Rent of land	$3 00
Cultivating in autumn	1 50
Ploughing in spring	2 00
½ manure applied at rate of 20 tons per acre and valued at $1 per ton	4 00
Harrowing twice	0 50
Seeding 1½ hours	0 37
Seed, 3 lbs. at 10c	0 30
Hoeing 3 times, 2 days at $1.25	2 50
	$14 17

Yielded 30 tons.

Cost of producing 1 ton	47 cents
Average dry matter per ton	200 lbs.
Cost of 100 lbs. dry matter	23½ cents

PUMPKINS.

Part of the second year of the rotation area was devoted to pumpkins. The portion selected was adjoining the autumn pasture for convenience in feeding. The soil was a sandy loam, and fairly well drained. Manure was first applied at the usual rate of 15 tons per acre, worked into the soil. The plot was then thoroughly cultivated and harrowed. It was marked off into 8-foot squares, and a small hole about 18 inches square and 6 inches deep excavated at each corner. This was filled about half full of barnyard manure (scrapings), a layer of earth thrown over it, and the seeds planted in this layer.

The plants grew apace, and in a short time covered the whole area. Much fruit developed, and grew to a fair size. The yield from the half acre being 1,250 pumpkins, averaging 14½ pounds, or about 9 tons.

These were fed partly to the dairy cattle, which seemed to do well upon them. A large number were fed to pigs. One lot fed on raw pumpkins did fairly well, making a gain of 745 pounds in 107 days, at a cost of $3.08 per 100 pounds gain. They ate 2,090 pounds pumpkins and 1,981 pounds meal half corn, half oats, pease and barley equal parts.

Another lot of 6 pigs, fed on cooked pumpkins, did exceedingly well, making 706 pounds increase in 99 days, at a cost of $2.96 per 100 pounds gain. They ate 7,500 pounds pumpkins and 1,602 pounds meal.

Cost of Production.

Rent, ½ acre, at $3 per acre	$1 50
Cultivating in autumn	80
Ploughing in spring	1 00
Harrowing twice	20
Rolling	10
Manure, ½ of 7½ tons, at $1 per ton	1 50
Seed, 10 cents, and seeding, $1.70	1 80
Hoeing, 1 day	1 25
	$8 15

Total yield, 18,125 pounds. Cost of producing 1 ton, 90 cents.

One ton contains about 190 pounds digestible dry matter. Cost of producing 100 pounds digestible dry matter is 47 cents.

THE JERUSALEM ARTICHOKE *(Helianthus tuberosus.)*

A plant that is attracting some attention as yielding a plentiful supply of succulent and apparently rather nutritious food for pigs is the Jerusalem artichoke. Its value would, however, appear to be lessened by the great length of time required to mature the tubers or even produce them in any considerable bulk at the base of a plant.

A plot one sixteenth of an acre (10 square rods) in area was sown May 19, with about 70 pounds of tubers. They were planted 4 inches deep, in rows 24 inches apart and in hills about 20 inches apart in the rows. They required but little cultivation, as they soon grew so dense as to kill all other or less vigorous forms of plant life. The growth of the plant for about three months was confined to the stem, leaves and roots alone, no appreciable development of tubers being observable. In September young tubers made their appearance and slowly developed.

On October 3 only small tubers about the size of hen's eggs were found on digging, although the plants had made a most luxuriant growth, standing 10 to 13 feet high, and about 50 per cent of them, being in flower.

Although the tubers were immature, it was decided in view of the lateness of the date to turn the pigs in at once. Accordingly on the above mentioned date six crossbred pigs were turned free in the lot. They were allowed 1½ pounds of meal each per diem in addition to the artichokes, which they rooted out most industriously and ate most greedily. I have never seen pigs eat anything with more gusto.

The following table will give some idea of the progress made by this lot of pigs while on artichokes and so of the value of artichokes as a supplementary food for pigs:—

No. of Pig.	Weight, Oct. 3.	Weight, Oct. 24.	Gain.	Daily rate of Gain.	No. of Pig.	Weight, Oct. 3.	Weight, Oct. 24.	Gain.	Daily rate of Gain.
	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.	Lbs.	Lbs.
263	100	131	31	1·47	269	109	145	36	1·71
264	105	141	36	1·71	271	95	127	32	1·52
267	106	138	32	1·52					
268	111	141	30	1·42	Total	626	823	197	1·57 Average

The daily average of 1·57 pounds is remarkable in pigs of such live weights, but becomes still more worthy of consideration when we remember the small amount of grain fed per diem.

During the twenty-one days the 6 pigs consumed 189 pounds of meal (½ corn, ½ oats, pease and barley equal parts), at 90 cents per cwt., $1.70, while the meat produced valued at current prices ($6.25 per cwt.), was worth $12.31, leaving a balance of $10.61 for the sixteenth of an acre of artichokes. Putting this in another way we have 197 pounds pork produced at a cost as follows :—

189 pounds meal at 90 cents		$ 1 70
One-sixteenth acre artichokes cost for seed	$ 0 50	
For planting, &c	1 00	
Rent, $5 per acre	0 35	
		1 85
Net cost		$ 2 55

That is one pound of pork produced at a cost of 1·8 cents.

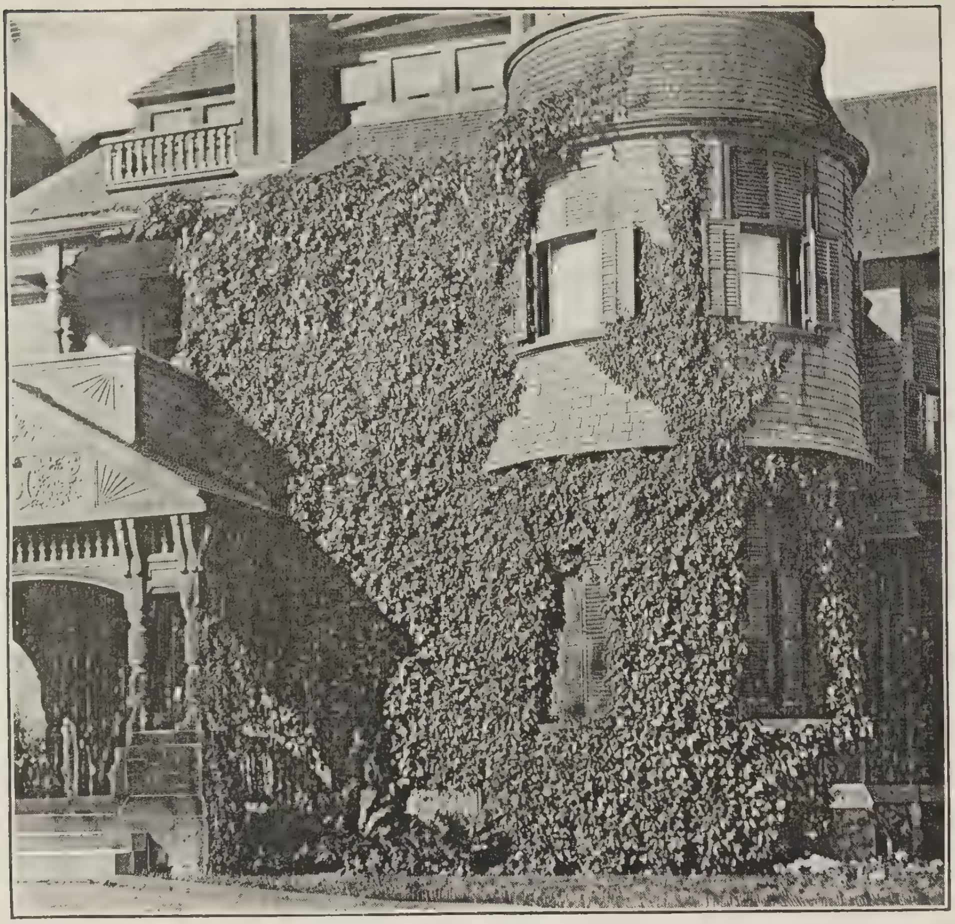
This tuber may be sown in the autumn and will then start to grow early the next year, or the crop may be left unharvested till the ensuing spring and the pigs allowed to root them out as soon as the frost comes out.

SUMMARY.

The following tables of cost of production of (1) a ton of stored forage or threshed grain, and (2) 100 pounds of digestible dry matter are submitted with the end in view of showing the comparative cost of producing each if not generally at least in one instance :—

Number.	(1). Cost of producing 1 ton of stored forage or threshed grain in the form of :	$ cts.	(2). Cost of producing 100 pounds of digestable dry matter as yielded by :	cts.
1	Rape	0 47	Barley straw	20
2	Pumpkins	0 90	Pea straw	21
3	Mangels	0 96	Rape	23·5
4	Corn (ensilage)	1 25	Oat straw	27
5	Carrots	1 37	Clover	30·6
6	Turnips	1 63	Mixed hay	43 6
7	Pea straw	1 73	Corn (ensilage)	44·4
8	Barley straw	1 83	Pumpkins	47
9	Sugar beets (for forage)	1 87	Sugar beets (for sugar)	48
10	" (for sugar)	2 14	Mangels	48
11	Oat straw	2 32	Sugar beets (for forage)	50
12	Clover	3 12	Barley	65·8
13	Mixed hay	4 45	Carrots	68
14	Oats	9 21	Oats	73
15	Barley	10 07	Turnips	77
16	Pease	15 70	Pease	90.2

In speaking of the comparative cost of the above, both as stored material and as digestible dry matter, it is not attempting to differentiate their feeding values. It will not of course be understood that because a certain forage is produced at a small cost it will pay to feed or grow only that variety. Frequently when a form of digestible dry matter can be produced cheaply it is of a character to necessitate the addition of some more expensive material before being fed. An example of such a case would be afforded by barley straw which produced digestible dry matter at a cost of 20 cents per 100 pounds, which if fed exclusively would result in practically starving the animal, while a small addition of pea meal would make the ration a fairly good one.



Self-fastening Virginia Creeper growing on house of Director Central Experimental Farm.

Part of Apple Orchard, Central Experimental Farm, showing cover crop of Red Clover.

REPORT OF THE HORTICULTURIST.

(W. T. Macoun.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit, herewith, the fourteenth annual report of this division. While space will not permit of going fully into the details of all the experiments which were conducted during the past year, nor of treating any one subject at great length, the aim has been, in preparing the following report, to present a summary of most of the work undertaken by the Horticulturist, and to give the results of such experiments as it was thought best to publish this year.

Character of Season.—The climate of the Ottawa Valley is, as a rule, very favourable to the production of such fruits as will endure the winters, and the weather this year was not exceptional in that respect. The atmospheric conditions which usually prevail in the valley seem to be such as to prevent any long continued drought in summer, and thus it is not often that there is too little rain. The winters are long and rather severe, but there is generally a good covering of snow to protect low growing plants and the roots of trees. The weather was very changeable last winter, there being no long spells of cold nor of mild weather. Up to March 1, there had not been more than from ten to twelve inches of snow on the ground at one time. During the third week of January nearly all the snow that was then lying on the ground disappeared. On March 1, 18 inches of snow fell, and on the following day 6 inches more. This came in a very opportune time, protecting the roots of the trees at a critical period of the year. The coldest day of the winter was on February 2, when the temperature fell to 21·5° F. below zero.

The snow gradually disappeared after the middle of March, but as there were few warm rains or little rain of any kind, the frost did not leave the ground readily and the spring was backward. The frost was out of the ground enough to use the spade on April 19, although it could still be found in spots for several weeks afterwards. Compared with last year, the opening of spring work was only one day later.

The weather remained quite cool until May 13. On the 10th and 11th of that month there were four and five degrees of frost respectively, but as there had been little growth up to that time very little injury was done. On May 14 the weather became quite warm, the temperature rising to 86° F. This was the first day that growth was at all rapid. While this rise in temperature was followed again by cool weather, the last week of the month was quite warm, the temperature being 81° F., 82° F., and 83° F., on the 26th, 27th and 28th. No frosts occurred after the 11th. June was a very favourable month for plant growth, their being sufficient rain to keep everything growing well. Most of the month of July was showery, but there were few storms and the weather, though warm at times, was never hot. August was also a favourable month for plant growth. On the 6th, the temperature was 90° F., and on the 26th, 91° F., these being the hottest days of the month.

September was an exceptionally fine month, until the third week, which was wet, the temperature, as a rule, being mild or warm. There was a light frost on the 19th, but only the melons were injured. The highest temperature of the year occurred on the 2nd, when it rose to 93·8° F. October began with fine weather in much the same way as September had ended, and there was no killing frost until the 17th, when the

leaves on the grape vines were killed and the fruit injured. Such tender things as cannas and dahlias were also destroyed. The temperature on that day was 27·8° F. Much fine weather followed, and there was no more severe frost until November 13, when the temperature fell to 15° F. On the 14th, four inches of snow fell and remained, although, as the weather becoming mild, nearly all the frost came out of the ground, and more snow following, there was practically no frost in the ground up to the end of the month. Winter set in much earlier than usual this year.

Fruit Crop.—The past season was favourable to most fruits, the yield and quality, on the whole, being good. Many varieties of apples produced good crops, and as the trees have now been planted for twelve years, the quantity of fruit picked from them this year was considerable, some trees producing from 2½ to 3 barrels. Only a few pear trees fruited, as there are not many trees of a bearing age in the orchard, most of them having been killed by winter or blight from time to time. The crop of American plums was very good, and some of the newer varieties are quite promising. As with pears, very few trees of the European varieties of plums were old enough to bear, as these are killed out by the winter from time to time. The cherry crop was practically a failure, for, although some of the trees bloomed very well, little fruit set. Grapes did comparatively well, but not as much fruit set as usual. They were very slow in ripening, and if there had been early frosts few varieties would have matured. As it was, however, 81 kinds ripened, the fruit being of good quality, but not as well flavoured as when it ripens rapidly. The strawberry crop was exceptionally good and the picking season longer than usual. As prices for strawberries were high in Ottawa this year, local growers must have found them very remunerative. Raspberries also did well, and the quality of the fruit was good. Currants were not as good as usual; and although the American gooseberries did well, the European varieties produced very little fruit, as mildew was bad. The latter might have been controlled somewhat by spraying the bushes with potassium sulphide, but only the new plantation was sprayed.

PROGRESS OF THE WORK.

Owing to the favourable season this year, nearly everything made satisfactory progress in the horticultural department.

The work of top grafting the tenderer varieties of apples on hardy stocks was again a prominent feature of the work in the early spring.

During the winter, in the spring, and again in the autumn, experiments were conducted in spraying apple trees with a lime mixture to determine the best formula to use for the destruction of the oyster-shell bark-louse, which it had been found possible to remove by this means.

Cover crops have received special attention in this department during the past season, as in 1898 and 1899, the importance of having some covering in the orchard during the winter to protect the roots of the trees being fully recognized. Of all the cover crops tested here there is none as satisfactory as Mammoth Red or Common Red Clover.

Valuable data are being accumulated every year on the hardiness, productiveness, and quality of a large number of different kinds of fruits, and this year being a favourable one for fruits much information was gained, especially regarding varieties which had never fruited before.

There has not yet been found a hardy, late-keeping variety of apple suitable for growing for commercial purposes in northern and eastern Ontario and the Province of Quebec, which equals in quality, productiveness and appearance the best varieties grown in the more temperate parts of the provinces. A large number of seedlings of the best hardy apples which have fruited at the Central Experimental Farm have been grown, and will be planted out next spring, and it is hoped that in time, from

such seedlings and from cross breeding, that some good, late-keeping, hardy sorts will be obtained.

Few of the European plums are sufficiently hardy to be grown profitably in such a cold climate as that at Ottawa, and on this account special attention has been given to the improved American plums, no pains having been spared to make the collection of varieties as complete as possible. The American plums are being very rapidly improved, and some of the best of those which have fruited here are so good that it is hard to believe they have developed from the wild type.

This autumn, part of the Russian orchard, in which the trees had not made satisfactory growth, was drained, and it is expected that the land will be very much improved and the trees succeed better in the future.

Experiments with vegetables were again carried on this year to a considerable extent, in order that information might be obtained which would assist the vegetable grower as well.

The Arboretum and the Botanic garden looked well this season, as there was sufficient rain to keep things fresh and green all summer. As the trees and shrubs develop, they become more interesting and attractive. A large number of additions were made to the collection again in the spring.

The perennial border had a good show of bloom from early spring until late autumn.

Large collections of seeds were received this year from various arboreta and botanic gardens, and many new things have been obtained in this way.

The correspondence, as usual, has occupied much time, but as this is one of the few ways in which the knowledge gained can be imparted to the public, the time devoted to it is well spent.

Meetings attended and Places visited.—During the past year meetings were attended and addresses given at nine different places. On February 20 and 21, I attended the winter meeting of the Quebec Pomological Society at Granby, Que., and gave an address on 'The Development of Spraying in Canada.' By arrangement with the secretary of the Ontario Fruit Growers' Association, addresses were given before seven of the horticultural societies affiliated with it, my subjects being 'The Lawn and Garden,' and 'The Flower and Fruit Garden.' These meetings were held at Napanee on March 12, Port Hope on March 13, Cobourg on March 14, Trenton on March 15, Picton on March 16, Stirling on March 18, and Belleville on the 19th. I attended the annual meeting of the Ontario Fruit Growers' Association, on December 19, 20 and 21, and delivered addresses on 'Results of Experiments in Growing Fruit at the Central Experimental Farm,' and 'Garden Favourites.'

During the month of June, I visited the Grimsby district and Niagara peninsula, and at Niagara examined the trees which had been sprayed with lime mixture the previous winter. The months of July and August were spent in Great Britain, Ireland, and at the Paris exposition, and while not absent on official business I endeavoured to learn as much as possible of the horticultural conditions in the places visited, and brought home much information which will be helpful to me in my work.

Acknowledgments.—It is again a pleasure to acknowledge the assistance which has been kindly furnished me by a large number of fruit growers throughout Canada. The knowledge which I have gained by this friendly co-operation has enabled me to be of much greater service to the fruit growers, generally, than I otherwise would be. Fellow-workers in the United States have also furnished me with much valuable information.

As I was absent about two months last summer in the old country, the responsibility of carrying on the work of the horticultural division fell on Mr. J. F. Watson, secretary, and Mr. H. Holz, foreman. I was very gratified on my return to find that the former had kept the correspondence and other work in the office in good order,

and that the latter had spared no pains to keep everything running smoothly and satisfactorily outside.

DONATIONS.

Sender.	Donations.
Annis, A. E., Dryden, Ont	Native pine and spruce trees.
Archambault, Jos., St. Lin, Que	Apple scions.
Arnold Arboretum, Jamaica Plains, Mass	Seeds of trees and shrubs.
Aylmer Pump Co., Aylmer, Ont	Barrel spray pump.
Beaman, E. C., Newcastle, Ont.	Scions of 14 varieties of pears.
Botanic Gardens, Saharunpore, N. India	Collection of seeds.
Brodie, R., Montreal, Que	Scions of Sunset Russet apple and Isham crab apple.
Carruthers, Jas., Magundy, N.B.	Potatoes.
Carter, J. H., Massawippi, Que	Scions of Pomme de Fer apple.
Chapais, J. C., L'Lslet, Que	Plum scions.
Craig, Prof. John, Ames, Iowa	Apple scions.
Curry, S. L., Weldon, Iowa	Scions of Curry plum.
Dempsey, W. H., Trenton, Ont	Samples of fruit ; apple scions.
Elm City Nursery Co., New Haven, Conn	1 tree Hinman Peach; 1 Meeker cherry tree.
Ferguson, A., Port Morien, C.B., N.S.	Potatoes.
Gow, J. E., Windsor, Ont	Plant of prickley pear cactus.
Hamilton, R., Grenville, Que.	Scions of Blair and Childs' crab apples.
Hansen, Prof., Brookings, S.D., U.S.	Scions of Odegard plum.
Imperial Botanic Gardens, St. Petersburg, Russia	Collection seeds.
Johnston, Asa, East Farnham, Que	Scions of Bethel apple.
Johnstone, John, Long River, P.E.I.	Native spruce trees.
Jones, Harold, Maitland, Ont	Seedling pear trees.
Jones & Conard, New Grove, Pa	Plant New Century rose.
Lamb, Jas., Walkerton, Ont	Potatoes.
Matheson, D., Ottawa, Ont	Grape cuttings.
Newman, C. P., Lachine Locks, Que	Scions of 2 seedling apples.
Oren, J. K., Brandon, Iowa	13 Oren plum trees.
Peterson, P. S., & Son, Chicago, Ill	Cuttings of trees and shrubs.
Pitcher, Rev. J. T., Smith's Falls, Ont	Lily bulbs.
Reid, W. C., Belleville, Ont	Two trees of Akin red apple.
Robson, W. E., Minden, Ont	Scions of Jesmona apple.
Royal Botanic Gardens, Kew, England	Willow cuttings ; collection of seeds.
Shepherd, R. W., Como, Que	Scions of Red Canada and Switzer apples.
Snaison, R. A., Uxbridge, Ont	Potatoes.
Snelling, W. H., New Edinburgh, Ont.	Two seedling plum trees.
Snow, C. H., Cummings Bridge, Ont	Strawberry plants.
Starr, R. W., Wolfville, N.S	Plum trees and hardy roses.
Stevenson, A. P., Nelson, Man	Scions of Peerless apple.
Strachan, Alex., Southampton, Ont	Potatoes.
Tait, David, Iron Bridge, Ont	Scions of Kirkland apple and Warner pear.
Todd, F. G. Montreal	Six large specimens of *Rhododendron maximum.*
Trotter, Miss L., Owen Sound, Ont	Pear scions.
Walker, Jos., Strathroy, Ont	Scions of unknown apple.
Webster, F. Ashbrook, Arbroath, Scotland	Rose bushes.
Wile, S., Branch la Have, N.S.	Potatoes.
Young, C., Richards Landing, Ont	Scions of Charlamoff apple.

I have the honour to be, sir,
Your obedient servant,

W. T. MACOUN,
Horticulturist.

APPLES.

The trees in the apple orchard continue to make good growth, on the whole. Every year, however, some of them die, and the proportion of deaths is greatest among the oldest trees, which have now been planted twelve years. The varieties which suffer most are those of Russian origin, Duchess of Oldenburg, especially, being one of the number. The trees are usually blown down by storms, and on examination it is found that most of the roots, and nearly all the wood in the trunk, is rotten. Duchess of Oldenburg is considered one of the hardiest varieties of apples grown, but the trees are probably weakened by overbearing. Some of the Russian apples are growing in soil which has not been hitherto thoroughly drained, and this may be one of the causes of their early death. The Duchess trees however, are growing in the best soil in the orchard. Another cause of death may be that the roots, having nearly all been killed by winter in some previous year, did not supply sufficient sap to the tree, and hence it died or blew down because there were not enough roots to hold it in place. There is considerable evidence to show that this is one of the principal causes of death. In former years some of the trees were badly affected with blight, many large branches having been removed. It is possible that this disease remained in parts of the trees and caused decay to set in. There has not been very much blight (until this year), and very little root-killing since 1896, and the trees planted since that time are doing well. It very often happens, however, that trees which are quite healthy when young, soon die when they begin to bear heavily.

There was practically no root-killing of apple trees last winter, as there was a good covering of snow during the latter part of the winter, and an excellent cover crop of red clover in the orchards, and in some parts, Alfalfa clover. As has been the custom during the past three seasons, the clover was cut and let lie on the ground to rot. Owing to other pressing work, it was not possible to cut it the first time just as the flower heads were beginning to show, and it was in full bloom before it was mown, the result being that the plants were considerably weakened, and only four good crops were cut instead of five, which has been the case in the past. If then this system is adopted, the clover should be cut before the flowers are developed, if the best results are to be obtained.

A large number of trees bloomed well this year, but a smaller proportion of fruit set than is usual from the same amount of bloom. On examining some flower buds after the severe frosts of May 10 and 11, it was found that the pistils of those which were most advanced were, in many cases, destroyed, hence the frost had something to do with the fruit not setting as well as usual. The result, however, of the crop being thus lessened was that the apples were of much better size than if the trees had been heavily loaded. There have been 645 varieties of apples grown in the orchards and nurseries, and 193 varieties fruited this year.

The trees were thoroughly sprayed with Bordeaux mixture and Paris green as usual ; the early varieties receiving four applications, and the later ones five applications. There was no scab, and comparatively little fruit was injured by codling moth. It is now believed that the oyster-shell bark-louse can be kept well under control by spraying the trees with lime and water. The conclusions reached thus far being that two applications are sufficient. The best mixture has been found to be 2 pounds of lime to 1 gallon of water. Fuller directions for the use of this mixture will be found elsewhere. There were very few caterpillars this year, and no difficulty was found in killing what few there were.

The greatest injury to the trees was caused by fire blight. This began in the second week of June and continued throughout the summer. Very few trees, however, were badly injured, as in most cases only the smaller branches were affected, these being killed back from one to three feet, as a rule. In the Russian orchard, where most of the Russian varieties are, and where the blight made such ravages in 1895, the injury was comparatively small. In the standard orchard, however, where some of

the Russian varieties are planted, the Tetofsky was badly blighted, the fruit spurs, which are very prominent on this variety, being nearly all destroyed. Of twenty-seven trees none escaped. The Wealthy also suffered considerably, though none of the trees were badly injured. The berried or Siberian crab (*Pyrus baccata*), was affected worse than any of the named varieties, some trees being completely killed. No preventive or any other satisfactory remedy has been found for this disease. The usual practice is to cut off the branch about a foot below the affected part as soon as the blight is noticed.

The work of top grafting the tenderer varieties of apples was continued this year. Unfortunately, a large proportion of the grafts set this year were destroyed by blight during the summer. Most of the trees grafted in 1898 and 1899, however, are doing well. None of them have yet been killed back by winter.

Apple growing as far north as Ottawa, and in a similar climate, is attended with many vissicitudes, and there is much yet to be learned regarding this important industry before one may be fairly certain of having trees live to be a good age.

PEARS.

Little success has attended the efforts made to grow pears at the Central Experimental Farm. It is true that a few of the Russian varieties live to be eight or ten years old, but blight comes suddenly and destroys them. These pears are also very inferior in quality and are really not worth growing where better pears can be bought cheaply on the market.

Up to this year, the young pear trees in the orchard had grown well since 1896, having not been affected by blight in 1897, 1898 and 1899, and it was thought that perhaps it would not appear again for some time, but this year the trees were affected again and by the time the summer was over many were dead, while others were killed back more or less badly. A tree of Flemish Beauty, planted in 1890, has been bearing lightly since 1897, and appears quite hardy. It was not affected by blight this year to any extent. Scions have been taken from this tree and grafted, and it will be interesting to learn whether the young trees will prove hardy and free from blight or not. This work will be continued, different stocks used, and other methods of grafting adopted, in the hope that a hardy strain of this fine pear will be obtained. The Longworth pear, which was originated in Iowa, is a very hardy variety and has proved free from blight here. A fair crop of fruit was produced this year, but it is of inferior quality. Season, September.

PLUMS.

The trees in the plum orchard continue to do well. There was a good crop of American plums, and fifty-eight varieties bore fruit this year. A few of the European plums fruited also.

The European and Japanese plums are so uncertain in climates as severe as that at Ottawa that they should not be planted for commercial purposes, unless the orchard has good protection, and even in that case there are but few that would give satisfaction.

It is necessary, therefore, to fall back on the American plums, and as these are being improved very rapidly by selection and by cross-breeding, and are perfectly hardy, they offer a strong inducement to plant plums for profit where the European or Japanese varieties will not produce paying crops. Men who have been growing these plums for some years in the vicinity of Ottawa are obtaining good prices for the these plums may be had from the last week of August, until the last week of September.

Although there are several species of American plums, only two of them furnish most of the varieties that are profitable to grow in Ontario and Quebec.

The species found in eastern Canada is *Prunus nigra*, Ait., the type of which is distinguished easily at a glance from *P. americana*, Marsh, in being darker in the bark and with a much stiffer and more upright habit than the latter. The fruit of *P. nigra* ripens, as a rule, earlier than that of *P. americana*, and is usually more evenly covered with red. Some varieties are good in quality, but, as a rule, are not as high flavoured as those of *americana*. This species, however, varies considerably and sometimes it is difficult to decide whether a variety is *P. nigra* or *P. americana*. The trees bear heavily and regularly, but if they are not kept thoroughly sprayed the fruit becomes affected with plum blight, and withers and falls before becoming ripe. The species called *P. americana* is not known to occur in Canada, although the form of wild plum growing in Manitoba is much like it, but is intermediate in some characteristics between the two. Its range is from New Jersey to Montana. The named varieties which have sprung from this species comprise most of the best kinds now offered for sale. This tree grows from 10 to 20 feet in height, is of spreading habit and is usually quite hardy where the native species grows. It bears heavily and regularly, as a rule, and the fruit of the best varieties is of good size and attractive appearance, and, although not equal in quality to the best European plums, is juicy, sweet, often high flavoured, and at all times refreshing. The skin is sometimes more or less acrid, but this is not apparent when eating some of the best varieties, although when canned or preserved, it sometimes develops, though often it does not. *P. americana* does not suffer from blight to any extent, and this is an important reason why varieties of it should be planted instead of *P. nigra*, unless the trees are properly sprayed.

The following technical descriptions of the two species, made by Waugh, give their distinguishing characteristics in greater detail and accuracy:—

'*P. americana*, Marsh.—Common Wild Plum. The type distinguished by entire calyx lobes, which are pubescent on the inner surface; stone turgid; leaves oval or slightly obovate; petioles mostly without glands. Tree spreading, ragged, thorny, 8 to 20 feet high; flowers large, white, on slender pedicels; leaves very coarsely veined, never glossy or shining; fruit more or less flattened upon the sides, firm and meaty, the skin tough and glaucous and never glossy, ripening through yellow to red. Occurs wild from New Jersey and New York to Montana and Colorado. It varies southward, in Texas and New Mexico represented mostly by the variety *mollis*.

'Var. *nigra*. Canada Plum, Red Plum (*P. nigra*, Ait., *P. americana* T. & G. and 6th ed. Gray's Manual.) In its extreme forms easily distinguished by the glandular-serrate calyx lobes, glabrous on the inner surface; compressed stone; broadly oblong-ovate to obovate leaves with petioles bearing two glands. Flowers large, white, with short thick peduncles conspicuously marked by the scars left by the falling of the bud scales; pedicels dark red, slender, glabrous; calyx tube broadly obconic, dark red on the outer and bright red on the inner surface; fruit oblong-oval, orange-red; stone nearly oval, compressed. Occurs wild from Newfoundland west to Rainy and Assiniboine rivers in Canada, and commonly in the New England States, where it is found along roadsides and in waste places.'

The plum has been well studied by Prof. F. A. Waugh, of Burlington, Vt., and through his work the fact has been established that practically all varieties of American plums are self-sterile. In other words, there would be no fruit in an orchard containing a number of trees of one variety only, unless the wind or insects carried pollen of other varieties to fertilize the flowers. This knowledge is of great importance to the fruit grower. It is another indication that 'nature abhors perpetual self-fertilization.' While a variety is self-sterile in itself, if it is fertilized by another self-sterile variety, fruit will be formed, and vice versa. It is necessary, then, if good crops are to be obtained, to have more than one variety growing in the orchard, to have the varieties bloom at the same time, and to have them of the same species, if possible; and, failing that, to have the species as closely related as possible.

At the Central Experimental Farm there are now 76 varieties of American plums, a large proportion of which have fruited, and following are descriptions of the best of them, with names of the varieties which may be used as pollenizers to fertilize them:—

AITKIN, *nigra*.—Ripe August 22, 1899, and August 24, 1900. Fruit large, oval, suture merely an obscure line; colour uniformly deep red all over; flesh deep yellow, juicy, sweet, but not rich nor high flavoured; stone large, flat, semi-cling; skin rather thin, tough and astringent. Quality above medium. Tree a vigorous upright grower and a medium bearer. As grown here, the only good points in this plum are its earliness and attractive appearance; but earliness is a very desirable characteristic, and it is worth planting on this account. Cheney, however, which follows it in ten or eleven days, is so much better in every way, and for home use, especially, that it is much to be preferred.

CHENEY, *nigra*.—Ripe September 2, 1899, September 4, 1900. Fruit large, oblong to roundish, suture distinct; colour uniformly purplish-red all over; flesh deep yellow, juicy, sweet, rich; stone of medium size, flat, cling; skin moderately thick, tough, without astringency. Quality good. Tree upright, vigorous, and a good bearer. This and Bixby are the two best early plums which have fruited here, and they should both be planted.

BIXBY, *americana*.—Ripe August 31, 1899, September 6, 1900. Fruit large, round; colour yellow, more or less covered with red; bloom rather heavy; flesh deep yellow, juicy, sweet, rich; stone of medium size, almost free; skin thick but tender and without astringency. Quality very good. Tree spreading, vigorous, and a heavy bearer. This is the earliest good plum of the *americana* group which has fruited here. It is well worth growing on account of its earliness, productiveness and quality. It does not ripen its fruit as early as some nor is it very firm, but on the whole it is a good plum.

GAYLORD, *americana*.—Ripe September 6, 1899, September 13, 1900. Fruit almost large, roundish, somewhat heart-shaped, suture distinct; colour yellow, almost covered with deep red, with a bloom; flesh deep yellow, juicy, sweet, rich; stone of medium size, free; skin moderately thick and fairly tender; slightly astringent. Quality good. Tree spreading, vigorous, and a good bearer. A fine plum.

NEW ULM, *americana*.—Ripe September 11, 1899, September 18, 1900. Fruit large, nearly round, somewhat heart-shaped, suture distinct; colour yellow, more or less covered with pink or purplish-red, sometimes the surface has a mottled appearance when the yellow shows through the red; bloom moderately heavy; flesh deep yellow, juicy, sweet; stone of medium size, cling. Skin thick and tough, but not astringent. Quality good. Tree vigorous, of a low, spreading habit, and a good bearer. This is a firm plum, and should prove a very useful sort for shipping.

WOLF, *americana*.—Ripe September 14, 1899, September 18, 1900. Fruit large, roundish to oval; suture fairly distinct; colour uniformly dull deep-red all over; bloom moderately heavy; flesh deep yellow, juicy, sweet, rich; stone large, cling; skin thick and tough, and but slightly astringent. Quality good. Tree somewhat spreading, vigorous, productive. The Wolf as grown at the Central Experimental Farm is different from that described by most writers; one great difference being that the one grown here has a cling stone. There is no other plum in our collection, however, which resembles it, hence the name will not be changed for the present. It is one of the very best of the American plums. The Wolf described by others is also said to be one of the best. When it fruits here the two will be compared.

CITY, *americana*.—Ripe September 14, 1899, September 18, 1900. Fruit large, round; suture distinct; colour yellow, almost covered with red, but not of a very

attractive shade; bloom moderately heavy; flesh yellow, juicy, sweet; stone of medium size, free; skin thick, moderately tender, slightly astringent. Quality good. Tree low growing, spreading, vigorous and productive. The fruit of this variety is firm, and should ship well. It is spoken highly of elsewhere also.

SILAS WILSON, *americana*.—Ripe September 18, 1900. Fruit very large, roundish; suture distinct ; colour yellow, more or less mottled with purplish-red ; bloom moderately heavy ; flesh yellow, juicy, sweet, rich ; stone above medium size, semi-cling ; skin moderately thick, fairly tender, not astringent ; quality very good. Tree spreading, vigorous. This is the first year that this variety has fruited here, but if it is productive it should prove one of the most valuable. It is the largest and best in quality of all the American plums which have yet fruited here.

STODDARD, *americana*.—Ripe September 19, 1899, September 18, 1900. Fruit very large, almost round ; suture distinct ; colour yellow, almost covered with purplish or coppery red ; bloom moderately heavy ; flesh yellow, juicy, sweet, rich ; stone large, cling ; skin thick, but moderately tender, not astringent. Quality very good. Tree vigorous, spreading and moderately productive. On account of its size, appearance and quality, this is one of the best of this class of plums. Next to Silas Wilson, it is the best in quality of those which have fruited here.

HAWKEYE, *americana*.—Ripe September 22, 1900. Fruit large, roundish; suture distinct ; colour deep purplish-red ; bloom heavy ; flesh deep yellow, juicy, moderately rich ; stone large, flat, cling ; skin thick and tough, but not astringent. Quality good. Tree vigorous, spreading, productive. This variety resembles Stoddard very much, but is not as good in quality. It is, however, a very valuable sort.

WYANT, *americana*.—Ripe September 19, 1899, September 22, 1900. Fruit very large, irregular, roundish, somewhat flattened ; suture distinct ; colour yellow, but well washed and mottled with dull deep red ; bloom moderately heavy; flesh yellow, fairly juicy, sweet ; stone large, free ; skin moderately thick and tough, astringent ; quality medium. Tree vigorous, spreading. Has not proved productive here, but has elsewhere.

AMERICAN EAGLE, *americana*.—Ripe September 22, 1900. Fruit large, roundish, somewhat oval ; suture distinct ; colour deep purplish-red ; bloom moderately heavy ; flesh yellow, juicy, sweet ; stone of medium size, cling ; skin thick and tough, not astringent. Quality good. Tree vigorous. This is the first year that this variety has fruited here, but it promises to be a very useful sort. It is spoken of highly by others.

HAMMER, *hortulana*.—Ripe September 25, 1899, September 27, 1900. Fruit large, roundish ; suture distinct ; colour dark, dull red ; bloom heavy. The bloom brightens up this variety and gives it a very attractive appearance. Flesh deep yellow, juicy, sweet, with the peculiar flavour of the Miner plum ; stone medium in size, semi-cling ; skin thick and tough. Quality good. Tree vigorous, spreading, productive. This variety extends the season of the American plums very considerably. It has one drawback in the fact that it cracks easily. It is a hybrid between *Prunus americana* and *P. hortulana*, and on this account is hardier than if it were pure *hortulana*. Where a late plum is desired, this is a good variety to plant.

There are some other varieties which have been highly spoken of, and which, although being tested here, have not yet fruited. Among these may be mentioned Odegard (recommended for its extreme earliness), Legal Tender, Oren, Brittlewood, Terry, Smith and Kieth. The Surprise plum, which is said to be one of the best, if not the best, in quality, may not be hardy enough for the coldest parts of this country, as it is of the *hortulana* group, but it is said to be one of the hardiest of that group.

VARIETIES OF PLUMS AND THEIR POLLINATORS.

Cheney, Gaylord, New Ulm, Silas Wilson, City, will pollinate one another.

Bixby, Wolf, Stoddard, Haweye, Wyant, American Eagle, Hammer will pollinate one another.

Aitkin has no good pollinator among the other varieties recommended, as it is a very early bloomer, Cheney, which comes nearest being one, is not in full bloom until six days later.

GRAPES.

In the annual report of the horticulturist for 1896, the grape was treated of at considerable length. There the methods of propagation, planting, cultivation, training and pruning the vines were well described. The various fertilizers for use in the vineyard were also mentioned. Recommendations were made on the thinning, spraying, picking and packing of the fruit, and a table published giving descriptions of the varieties tested at the Central Experimental Farm, with date of planting, origin, vigour, and date of blooming and date of ripening, colour and yield of fruit. Notes were also published on the relative value of the different varieties for wine or dessert purposes.

The information given in the report for 1896 is just as valuable now as it was then, and it is, therefore, not necessary at present to again describe the culture of the grape in full. As the horizontal arm system there described is probably the best one to adopt in those parts of Canada where the grape is not grown on a commercial scale, and where the vines have to be covered with soil every winter, the description of that method, which was published in 1896, is herewith given again, with such additional notes as are thought necessary :—

Horizontal System.—'This method of training is especially adapted to sections of the country where it is advisable to give the vines winter protection. Two strong canes are trained in opposite directions. The laterals springing from these are trained perpendicularly. In the autumn the laterals are cut back to two spurs. When the spurs become weak they are renewed, as is an entire arm, occasionally. This system calls for a four-wired trellis, in order to properly tie the strong laterals.'

As the vines have to be bent down and covered with soil every winter to protect them, more emphasis should be laid on the necessity of renewing the arms from time to time. When the arms get large and stiff they are hard to bend, and more soil is required to cover them. Furthermore, the buds become weak on old arms, and after a time do not grow at all, except at the outer extremity, so that it is very important to renew them as soon as anything of this kind is apparent. A good crop of fruit will be produced on arms of the previous season's growth if the root from which they spring is more than two years of age. It is important also when starting the arms to get them from within a foot of the ground. If there is a high stub it is so much more difficult to cover.

It is difficult to describe the summer pruning of the vine, but experience will soon teach what is necessary. It will be found that more laterals will grow than are desired to bear the crop which is wanted. These should be pinched out. Suckers will also grow, which should likewise be destroyed, as should all side-shoots from the laterals which are bearing the fruit. The main object in thus thinning out the vines is to allow the fruit to get plenty of sunshine.

The vines are protected in winter by simply bending them down and covering them with enough soil to hold them in place.

The season of 1900 was not very favourable for grapes at Ottawa, although 81 varieties matured at the Experimental Farm, but they were not as good in quality as in some years. It was very showery all summer, and this caused a greater growth of

vine than was best for the proper development and ripening of the fruit. While there were no early frosts in autumn to injure the vines or fruit, the weather was not warm enough to induce rapid ripening, and on this account the grapes were not as sweet as they sometimes are.

Red clover seed was sown in the vineyard on July 21, and a good cover crop was formed by autumn. This will help to hold the snow and afford a better protection to the roots of the vines. It will also be useful for ploughing under in the spring. This autumn, the work of renewing the old arms was continued, most of them having now been treated in this way.

As it is important to know what varieties of grapes are likely to ripen every season in places where only the earliest sorts will mature, the following table is given, in which will be found fifteen of the very earliest sorts growing at the Central Experimental Farm. These varieties have been obtained by selecting them from the earliest twenty-five of the past three years. The year 1898 was very favourable for the ripening of grapes. The year 1899 was just the reverse, September being cool and wet and severe frosts coming early. This year it was intermediate between the other two as, while no severe frosts occurred until late, the weather was not warm enough to cause the fruit to ripen rapidly. The varieties, then, which have ripened earliest in all of the past three years, should be certain to ripen almost every year.

LIST OF FIFTEEN OF THE EARLIEST VARIETIES OF GRAPES.

Name.	Date of Ripening.	Date of Ripening.	Date of Ripening.	Average date of Ripening.	Colour of Fruit.	Size of Fruit.	Quality of Fruit
	1898.	1899.	1900.	1898-1900.			
Florence	Sept. 2	Sept. 7	Sept. 10	Sept. 7	Black	Above medium	Poor.
Champion	" 3	" 17	" 18	" 13	"	" "	"
Pattison	" 6	" 23	" 12	" 14	"	Medium	Medium.
Moore's Early	" 6	" 21	" 24	" 17	"	Above medium	Above medium.
Moyer	" 6	" 23	" 25	" 18	Red	Below "	Good.
Golden Drop	" 10	" 17	" 26	" 18	White	Small	Above medium.
Peabody	" 6	" 23	" 28	" 19	Black	Below medium	" "
Canada	" 10	" 23	" 26	" 20	"	Small	" "
Telegraph	" 12	" 23	" 26	" 20	"	Above medium	" "
Brant	" 13	" 22	" 26	" 20	"	Small	" "
Belvidere	" 10	" 25	Oct. 4	" 23	"	Medium	"
Early Victor	" 10	" 27	" 2	" 23	"	"	Medium.
Cottage	" 10	" 27	" 4	" 24	"	Above medium	Above medium.
Marion	" 13	" 29	Sept. 29	" 24	"	Below medium	Medium.
Janesville	" 13	" 23	Oct. 5	" 24	"	Medium	"

It will be noticed that only one of these varieties is of good quality but, as has already been stated, these varieties are mentioned not for their quality but for their earliness. By referring to the reports of the horticulturist for former years, descriptions will be found of other and better sorts, but which are not quite so early. The Cambell's Early grape which will probably prove a valuable early variety has not yet fruited here and comparisons cannot yet be made with it.

RASPBERRIES.

A bulletin was published on the raspberry in 1895, in which the culture of this fruit was discussed and descriptions of many varieties given. Since that time, comparatively little has been published on this subject, the principal reason being that owing to the very unfavourable weather a large number of the bushes which comprised a plantation put out in the autumn of 1896, failed to grow. As the old plantation had been destroyed after the new one was made, there was no stock to draw from

to fill in the vacancies until sufficient plants were grown. For this reason there had not been sufficient data to publish until this year, when a large number of the varieties became in a condition to admit of reliable results being obtained. In the following table will be found the yields of the different varieties for the past season. A large number of these are cross-bred, and seedling sorts originated by Dr. Wm. Saunders, and this is the first year that comparative results have been published of them and the older named varieties. Some of the former are very productive and will probably, in time, take their place among the best varieties that are grown. The yields are, as a rule, from 12 bushes, planted in a row 36 feet long.

RASPBERRIES—TEST OF VARIETIES.

Name of Variety.	Date of First Ripe Fruit.	Date of First Picking.	Date of Last Picking.	Total Number of Pickings.	Total Yield. Lbs.	Oz.	Length of Row. Ft.	Remarks.
Red Varieties.								
Kenyon	July 14	July 16	Aug. 13	12	32	2	36	Large, firm, deep red, medium quality.
Henry	" 4	" 13	" 6	11	28	1	36	Above medium size, soft, good quality.
Brighton	" 7	" 13	" 9	10	27	2	36	Medium size, good quality.
Clarke	" 11	" 13	" 13	13	26	15	36	Large, deep red, good quality.
Count	" 7	" 13	" 9	12	26	13	36	Large, quality above medium.
Marlboro	" 9	" 13	" 13	13	24	9	36	Medium size, medium quality.
Muriel	" 8	" 13	" 9	11	22	10	36	Mediumsize, quality above medium.
Phœnix	" 9	" 16	" 17	13	21		36	Large, firm, medium quality.
Boyle	" 9	" 16	" 9	10	20	1	36	Medium size, medium quality.
Red Antwerp	" 11	" 13	" 9	11	16	12	36	Medium size, good quality.
Turner	" 11	" 13	" 13	13	16	7	36	Above medium, soft, good quality.
Herbert	" 11	" 13	" 13	12	15	14	36	Large, good quality.
Reliance	" 7	" 13	" 13	13	15	13	36	Medium size, poor quality.
Cassel	" 12	" 18	" 13	9	15	2	36	Above medium size, medium quality.
Garfield	" 11	" 16	" 13	12	15	2	36	Medium size, medium quality.
Lorne	" 7	" 13	" 13	12	14	11	36	Mediumsize, quality above medium.
Cardwell	" 10	" 16	" 9	10	14	11	36	Medium size, quality medium.
Nelson	" 11	" 13	" 9	11	14	3	36	Large, firm, quality above medium.
Trusty	" 6	" 13	" 13	12	13	7	36	Below medium size, soft, good quality.
Alma	" 11	" 13	" 13	12	12	15	36	Small, soft, poor quality.
Thompson's Early Prolific	" 9	" 13	" 13	13	12	10	36	Medium size, good quality.
Hornet	" 11	" 16	" 13	11	12	5	36	Medium size, medium quality.
Cardinal	" 12	" 20	" 13	9	12	4	36	Size above medium, medium quality.
King	" 7	" 13	" 17	14	11	3	36	Medium size, medium quality.
Craig	" 12	" 16	" 13	12	10	11	36	Above medium size, good quality.
Cuthbert	" 15	" 20	" 17	11	10	11	36	Large, firm, good quality.
Loudon	" 12	" 16	" 17	13	10	10	36	Large, good quality, not equal to Cuthbert.
Hansell	" 6	" 13	" 13	13	10	9	36	Medium size, good quality.
Heebner	" 12	" 18	" 13	11	10	6	36	Large, very good quality.
Herstine	" 12	" 18	" 9	8	8	7	36	Large, soft, good quality.
Biggar's Seedling	" 13	" 18	" 13	11	8	5	36	Below medium size.
Fontenoy	" 12	" 16	" 17	11	7	5	36	Large, soft, good quality.
Miller's Seedling	" 9	" 13	" 13	13	7	1	36	Medium size, medium quality.
Gladstone	" 7	" 13	July 27	6	6	9	36	Small, soft, good quality.
Deacon	" 12	" 18	Aug. 9	9	5	10	36	Medium size, medium quality.
Dora	" 12	" 18	" 1	5	5	6	36	Large, good quality.
Sir John	" 7	" 16	" 6	7	4	12	36	Medium size, good quality.
Baumforth	" 9	" 13	" 6	5	2	10	36	Large.
Empire	" 6	" 13	July 18	3	2	9	36	Medium size, medium quality.
Mary	" 16	" 18	" 25	4	2	5	36	Above medium size, good quality.

RASPBERRIES—TEST OF VARIETIES—*Continued.*

Name of Variety.	Date of First Ripe Fruit.	Date of First Picking.	Date of Last Picking.	Total Number of Pickings.	Total Yield. Lbs.	Total Yield. Oz.	Length of Row. Ft.	Remarks.
Yellow Varieties.								
Caroline	July 16	July 20	Aug. 16	11	16	1	36	Medium size, medium quality.
Yellow Antwerp	" 12	" 16	" 9	8	11	4	36	Above medium size, good quality.
Golden Queen	" 16	" 23	" 13	9	8	1	36	Large, good quality.
Champlain	" 11	" 16	" 3	8	4	14	36	Large, soft, good quality.
Lady Anne	" 12	" 16	July 27	4	3	14	36	Medium size, medium quality.
Purple Varieties.								
Shinn	" 12	Aug. 13	" 13	13	27	8	36	Medium size, firm, quality above medium.
Duncan	" 14	" 18	" 13	10	18	15	36	Large, firm, quality above medium.
Shaffer	" 12	" 20	" 13	10	11	10	36	Large, good quality.
Ralph	" 16	" 20	" 9	8	8	7	36	Medium size, firm, good quality.
Percy	" 10	" 16	" 6	9	8	2	36	Large, firm, good quality.
Columbian	" 18	" 23	" 13	9	7	7	36	Resembles Shaffer, but milder and firmer.

RASPBERRIES GROWN IN LARGER PLANTATIONS.

Cuthbert (Red)	....	July 18	Aug. 16	12	92	7	236	Large, firm, good quality.
Sarah "	....	" 20	" 13	9	67	7	236	Large, firm, late, very good quality.
Heebner "	....	" 18	" 16	12	43	2	236	Large, bright red, very good quality.
Golden Queen (Yellow)	....	" 20	" 16	11	45	8	236	Large, yellow, good quality.
Progress (Black Cap)	....	" 14	" 13	11	84	5	236	Medium size, black, juicy, good quality.
Hilborn "	....	" 18	" 13	12	71	14	236	Medium size, black, juicy, very good quality.
Older "	....	" 15	" 9	10	47	3	236	Large, black, juicy, good quality.
Shaffer (Purple)	....	" 18	" 16	12	72	12	236	Large, purple, good quality.

CURRANTS.

The currant crop was not good this year. The bushes suffered considerably during last winter, and in the spring it was found that much of the bearing wood was dead. They have, however, made good growth this season, and a fair crop should be obtained next year. A new plantation will be started in the spring, as most of the old bushes have been planted since 1893, and by the time the new ones are in full bearing it will be time to root the old ones out.

The table giving the names of varieties with yields, &c., which was published last year, is again repeated with the yields of this year, and the average yield of the past three years included.

CURRANTS—TEST OF VARIETIES.

CURRANTS—RED.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Total Yield for 1900.		Average Yield per bush 1898.		Average Yield per bush 1899.		Average Yield per bush 1900.		Average Yield for three years.	
		1899.			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Red Dutch	1893	July 7.	Small to medium..	6	39	4	6	10	12	5	6	9	8	8
Raby Castle	1893	" 9.	" " ..	6	34	15	4	10	10	6	5	13	6	15
Red Grape	1893	" 8.	Above medium....	6	16	15	5	1	10	13	2	13	6	4
Greenfield	1893	" 9.	Medium to large..	6	20	8	7	9	7	3	3	7	6	1
London	1893	" 11.	Large	6	28	6	5	14	6	3	4	12	5	10
Early Scarlet	1893	" 7.	Medium	6	29	8	5	7	4	15	4	15	5	2
La Conde	1893	" 7.	"	4	8	8	4	10	6	7	2	2	4	6
Cherry	1893	" 8.	Small to medium..	6	19	3½	4	4	4	1	3	3	3	13
North Star	1893	" 7.	Above medium....	6	25	12	3	0	3	9	4	5	3	10
Wilder	1893	" 8.	Large	6	19	4	4	13	2	8	3	3	3	8
Ribes Striatum	1893	" 16.	Small	6	13	8	0	12	4	1	2	4	2	6
Prince Albert	1893	" 10.	Large	6	13	0	2	3	1	2	2	3	1	13
Fay's Prolific	1893	" 10.	Very large	6	3	3	0	12	2	10	0	8	1	5
Versaillaise	1893	" 7.	"	5	4	3	2	2	0	4	0	13	1	1
Simcoe King	1896	" 9.	Large	4	8	12	....		0	13	2	3	....	
Moore's Ruby	1893	" 10.	"	3	1	10½	....		0	2	0	9	....	
Cumberland Red	1896	" 8.	"	3	1	9	....		4	3	0	8	....	

WHITE.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Total Yield for 1900.		Average Yield per bush 1898.		Average Yield per bush 1899.		Average Yield per bush 1900.		Average Yield for three years.	
Climax	1893	July 10.	Large	6	28	8	3	15	3	10	4	12	4	2
White Grape	1893	" 10.	"	6	4	4	3	15	1	7	0	11	2	0
White Dutch	1893	" 8.	Medium	6	3	12	0	12	2	1	0	10	1	2

BLACK.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Total Yield for 1900.		Average Yield per bush 1898.		Average Yield per bush 1899.		Average Yield per bush 1900.		Average Yield for three years.	
Kerry	1893	July 14.	Above med. to large	6	20	2	5	4	7	9	3	6	5	6
Ontario	1893	" 14.	Medium to large..	6	17	8	3	7	9	4	2	15	5	3
Eagle	1893	" 12.	Med. to above med.	6	13	5	4	4	8	9	2	3	5	0
Ethel	1893	" 13.	" " .	6	10	10	5	8	4	5	1	12	3	14
Climax	1893	" 14.	Above med. to large	6	5	2	4	0	6	6	0	14	3	12
Clipper	1893	" 14.	Medium to large..	6	17	8	2	8	5	10	2	15	3	11
Success	1893	" 9.	Large	6	16	4	1	14	5	14	2	11	3	8
Stewart	1893	" 14.	Small to medium..	6	7	4	4	15	3	15	1	3	3	6
Perry	1893	" 16.	" " ..	6	6	5	2	2	5	14	1	1	3	0
Orton	1893	" 10.	Large	6	4	12	3	0	4	11	0	13	2	13
Winona	1893	" 12.	Above medium....	6	5	5	2	5	4	15	0	14	2	11
Monarch	1893	" 14.	Medium to large..	6	3	8	2	10	4	11	0	9	2	10
Charmer	1893	" 13.	Small to medium..	6	2	6	4	2	3	0	0	6	2	8
Eclipse	1893	....	Medium to large..	6	....		3	3	3	11	....		2	5
Prince of Wales	1893	" 14.	Small to medium..	6	1	3	3	15	2	7	0	3	2	3
Beauty	1893	" 12.	Medium to large..	6	2	1	2	5	3	12	0	5	2	2
Lee's Prolific	1893	" 13.	Medium	6	4	12	....		5	3	0	13	2	..
Standard	1893	" 12.	Large	6	5	2	2	12	2	4	0	14	1	15
Black English	1893	" 12.	"	6	2	15	2	2	2	14	0	8	1	13
Dominion	1893	" 12.	Medium	6	3	14	2	9	2	0	0	10	1	12
Ogden	1893	" 12.	"	5	2	1	2	9	2	1	0	7	1	11
Stirling	1893	" 14.	"	6	1	3	2	6	1	14	0	3	1	8
Mattie	1893	....	Medium to large..	6	....		3	2	1	2	....		1	7
Star	1893	" 14.	Medium	6	5	3	1	2	1	9	0	14	1	3
Lewis	1893	" 12.	Small to medium..	5	5	15	0	10	0	3	1	3	0	11
Black Naples	1893	" 14.	Medium to large..	5	0	9	0	15	2	6	0	2	1	2
Oxford	1893	....	Above medium....	6	....		1	6	0	8	....		0	10
Perth	1893	....	Medium to large..	6	....		0	10	0	13	....		0	8

The following varieties have been planted within the last three years :—

CURRANTS—RED.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Total Yield for 1900.		Average Yield per Bush 1899.		Average Yield per Bush 1900.	
					Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Moore's Seedling	1898	July 8	Very Large	5	6	12	0	2	1	6
Benwell	1898	" 8	Medium	6	5	2	0	$\frac{1}{3}$	0	14
Goliath	1898	" 8	"	6	4	10	0	2	0	12
Victoria Red	1898	" 7	"	6	4	9	0	$\frac{1}{3}$	0	12
Defiance	1898	" 9	"	6	2	14	0	$\frac{1}{4}$	0	8
Houghton Castle	1898	" 8	"	5	2	8	0	$\frac{1}{3}$	0	8
La Fertile	1898	" 8	Large	6	2	12	0	$\frac{1}{2}$	0	7
Knight's Large	1897	" 9	"	4	1	12	0	5	0	7
Wentworth Seedling	1898	" 9	Medium	5	2	4	....	....	0	7
Pomona	1897	" 7	....	6	2	0	....	....	0	5
Large Bunch Holland	1897	" 9	....	4	1	1	....	....	0	4

CURRANTS—WHITE.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Total Yield for 1900. Lbs.	Oz.	Average Yield per Bush 1899. Lbs.	Oz.	Average Yield per Bush 1900. Lbs.	Oz.
White Imperial	1897	July 10	Large	6	9	4	1	7	1	9
Wentworth Leviathan	1898	" 9	Medium	6	2	14	0	$\frac{1}{4}$	0	8
Transparent	1868	" 9	"	6	1	9	0	1	0	4

CURRANTS—BLACK.

Name.	Year Planted.	Date of Ripening.	Size of Fruit.	Number of Bushes.	Total Yield for 1900. Lbs.	Oz.	Average Yield per Bush 1899. Lbs.	Oz.	Average Yield per Bush 1900. Lbs.	Oz.
Victoria Black	1898	July 18	Very Large	6	8	5	1	1	1	6
Baldwin	1898	" 14	Above Medium	6	6	8	0	3	1	1
Black Grape	1898	" 18	Large	6	4	6	0	6	0	12
Buddenborg's Black	1898	" 16	Very Large	6	3	14	0	4	0	10
Imay's Prolific	1898	" 12	Med. to above Md.	6	3	0	0	11	0	8
Black Prince	1898	" 14	Large	6	0	13	0	3	0	2
Collin's Prolific	1899	....	....	....	....	....	....	....	....	....

GOOSEBERRIES.

The gooseberries in the new plantation which was made last year, made good growth this season, the growth of the American varieties being, however, much greater than that of the European. The American varieties should begin to fruit next season.

STRAWBERRIES.

The strawberry is the most popular small fruit that is grown in Canada, one reason being that enough luscious berries to supply the family needs may be grown on a very small area of land, and hence, it is possible for a large number of people to grow strawberries. Because of its popularity, many questions are asked regarding the best varieties to plant and the best methods of cultivation.

Already two bulletins (No. 5 and No. 27) have been published at the Central Experimental Farm on the strawberry. So great has been the demand for these publications that the supply of both is exhausted. In order that those who have not these bulletins, nor any other information on strawberry culture, may know the chief factors in growing strawberries successfully, the subject is again briefly discussed herewith.

SOIL.

To grow strawberries successfully, the soil should be well drained. The kind of soil is not, as a rule, more important than the drainage of it. Warm soils, such as sandy loam, will produce early fruit, but the yields will not always be as large as on clay loam. Much, however, will depend on the richness of it. Soil which will grow good crops of roots will grow good strawberries. In any case, a soil should be chosen which does not bake naturally or which by thorough tillage may be brought into such good condition that it will not bake.

PREPARATION OF THE SOIL.

Soil should be chosen, if possible, that has been prepared, in a measure, by growing a crop of roots which have been heavily manured. After the roots or other crops have been removed in the autumn, the land should be stirred deeply, it being the best practice to use a subsoil plough after the ordinary kind for this purpose. By using the subsoil plough the soil may be loosened to the required depth without bringing the subsoil to the surface, which would probably be the case if it were ploughed very deep with the ordinary plough. Clover sod land, ploughed in the autumn, is also good, as the sod furnishes humus. In the spring the soil should be brought into a fine state of tilth with the harrows, and where it is thought best, it may be ploughed beforehand. A heavy dressing of manure, from 20 to 30 tons per acre should be applied to the land, either the previous year or in the spring. If it is applied in the spring, it should be thoroughly rotted and well incorporated with the soil. Fresh manure applied in the spring renders the soil too open, and the strawberry plants do not start to grow readily. The roots also are liable to dry up and the plants die. It is difficult to plant strawberries unless the manure is well rotted and mixed with the soil.

As no after top-dressing will be equal to manure ploughed under some time before the plants are set out, it is very important, where manure can be had, to make the ground rich beforehand. Thorough preparation of the soil is one of the most important matters in strawberry culture.

PLANTING.

Successful planting may be done either in the spring or autumn. Spring, however, is the most satisfactory time, as if the plants are set then, when the soil is in good condition, they will make rapid growth and many runners during the summer, if properly looked after, and produce a full crop of fruit the following season.

Planting, however, should be done while the soil is still cool and moist. If planted in the autumn, there will, as a rule, only be a light crop of fruit the following season, and unless the weather is favourable when the plants are set, and the soil is moist, there may be very little growth indeed. If planting is done in the autumn, it should be as soon as the plants can be obtained with sufficient roots and when the soil is moist.

The most satisfactory method of growing strawberries on a large scale in Canada is by what is known as the matted-row system. The plants are set from 12 to 15 inches apart in rows from 2½ to 3½ feet apart. If proper cultivation is given, there should be no trouble in having a matted row of plants 18 inches to 2 feet in width by autumn. Planting may either be done by opening a hole for the plant by bending a spade backwards and forwards in the soil and then setting the plant in it and tramping it in with the foot, or by using a trowel. The latter method will usually give the better results, as the roots can be spread when planting, and the plants have much better conditions for growing. Great care should be taken to have

the crown of the plant just at the surface of the ground after it has been pressed in when planted. If it is too high, the results will be bad; and if too low, not much better.

CULTIVATION AND FORMING THE MATTED ROWS.

As the future crop will depend on the number and strength of the runners, it is very important to encourage rapid growth from the very start. Cultivation should begin as soon as possible after the plants have been set, and the surface soil should be kept quite loose and free from weeds until the cultivator interferes with the runners. The early cultivations should be deep, in order to loosen the soil in which the roots are to grow, and the after cultivations should be quite shallow, so as not to injure the roots. Hoeing will be necessary, occasionally, in order to destroy all weeds and loosen the soil close to the plants. Any blossoms which appear during the first season should be pinched off, and all the first runners should be destroyed, either with the cultivator or hoe. This is to make the parent plants as strong as possible before the runners which are to remain begin to grow. About the middle of July, or as soon as the strawberry season is over, the runners should be allowed to develop and take root. It will be found that some varieties form many, and some only a few. If very many are formed, they should be thinned out to from 3 to 6 inches apart, in order that the crowns may develop properly. The width of the rows will depend on the runners which are made. There should, however, be a path from 1 to 2 feet wide kept between the rows for the pickers to stand in.

HILL SYSTEM.

Large berries may be obtained by growing the plants in what is known as the 'Hill System.' The plants are set from 12 to 15 inches apart, in rows about 2 feet apart; the blossoms are kept pinched off the first season, as in the other system, and no runners whatever are allowed to form. By this method a very strong crown is developed; the plants, having more room, become very vigorous, and as a result, the fruit is much larger, and often as good crops are obtained as from the matted-row system. The plants should be protected in winter as when grown in the matted row. In the spring the crowns should be uncovered, but the mulch left on. This will help keep the soil moist and the fruit clean. If injury from heaving in winter is likely to occur, this system will not prove very satisfactory. There is also more labour connected with it than with the other.

WINTER PROTECTION.

After permanent frost has set in and the ground is quite solid, the plants should be covered with a light coat of clean straw, that which will not pack closely over the plants being the best. This will prevent the alternate thawing and freezing of the ground in the spring and protect the plants, if there is not much snow in the winter. While plants will often come through the winter without protection, it is best not to take any risks. After the frosty weather of early spring is over and before the plants begin to grow, they should be uncovered and the straw put between the rows to keep the fruit clean. As soon as the fruit has been picked, the straw should be removed altogether, the plantation weeded and the surface soil loosened with the cultivator, so that the runners may have a chance to root.

RENEWING THE PLANTATION.

If there is sufficient land available, the most satisfactory results will be obtained by only taking one crop off a plantation. It can easily be arranged to have one part

always in full bearing. It is quite possible to obtain two good crops, and this is often done where it is not convenient to make a new plantation every year. But the older the plantation, the less the crop will be, as a rule. The fruit will also be smaller and weeds will become very plentiful.

FERTILIZERS.

As a rule the strawberry crop is greater and the fruit better in proportion to the richness of the soil that the plants grow in. This being the case the soil, if not naturally rich, should be made so. No fertilizer is so good for this purpose as barn-yard manure, as it adds more humus to the soil than any other and is a complete fertilizer. This should be applied, when it can be obtained, in the manner already described in the preparation of the soil. Leguminous crops, such as clover and pease, ploughed under in the autumn are also very useful in adding nitrogen and humus to the soil. As a fertilizer with a fair proportion of potash is required, there is nothing better than wood ashes to suply it. Wood ashes may be applied broadcast in the spring when the land is being prepared for the plants, at the rate of 50 to 100 bushels per acre. If it is not convenient to furnish the necessary nitrogen, phosphoric acid and potash by the proper use of barn-yard manure, green crops, and wood ashes, it will be necessary to use a judicious mixture of the more expensive fertilizers to supply it, such as nitrate of soda, ground bone, and muriate of potash.

POLLINATION.

It occasionally happens that a person who has a variety of strawberry which yields much better with him than other varieties which he has growing along side, concludes to discard all his other kinds and grow that one variety. He does so and is disappointed to find that he has very few berries, and these ill-shaped and worthless. He does not know what to think about it, but writes to the Experimental Farm to learn what is the matter. The reply is sent back: 'Are you aware that the flowers of strawberries may be perfect or imperfect, or bisexual and pistillate ; in other words, do you know that some varieties of strawberries produce blossoms which have both male and female organs, while other varieties have only female organs; if you do not, the solution of your difficulty is very easy ?'

The male and female organs in plants perform the same functions as in animals, the fine dust formed on the stamens, which is shed when the flower is in bloom, is the fertilizing agent, it falls on the pistil and fertilization takes place. If the stamens are absent, or nearly all absent, as is the case in imperfect or pistillate flowers, no fruit, or very little fruit is formed. If a perfect or bisexual flowering variety and an imperfect flowering variety are growing in close proximity the flowers on both will be fertilized, as insects and winds carry the pollen or dust from the perfect to the imperfect. It very often happens that imperfect flowering varieties produce the best crops when properly pollinated, and this experience may lead fruit-growers who are ignorant of the foregoing facts, to make the mistake of planting only one variety, which may be imperfect.

A row of a perfect flowering sort should be planted to about every three or four rows of an imperfect variety to have good results. Of course, it is not necessary to plant an imperfect variety at all, as there are plenty of good sorts which have perfect flowers. It is essential to have the perfect and imperfect varieties in full bloom at the same time, as if the former bloomed before the latter there would be no object in planting it as a pollinator.

VARIETIES.

There are now so many varieties of strawberries offered for sale that it is very puzzling to the intending planter to know just what sorts to select. Some varieties

succeed better on certain kinds of soil and in certain districts than others, and the recommendations given as to the best varieties to plant should not be taken to mean that in all cases they will give better results than any others, but most of those which succeed best in one place will succeed best in others.

At the Central Experimental Farm there were 350 varieties tested during the past season. Of these, fully 75 per cent would not be worth growing anywhere where other kinds could be obtained. Probably over half of the kinds tested this season will be discarded next year.

The different varieties in the plantation are planted in rows 15 feet in length and $8\frac{1}{2}$ feet apart, there being two rows of each kind. They have all been given as nearly uniform conditions as possible, and on the whole it was a fair test. Some of the tenderer varieties were more or less winter-killed last winter, but most of them came through in good condition. The season this year was a very good one for strawberries. In the following table the yields and other data is given of the twenty-five varieties which yielded best, the names being arranged in order of yield. The letter B stands for bisexual or perfect and the letter P for pistillate or imperfect flowers.

TWENTY-FIVE best Yielding varieties of Strawberries, 1900.

Name.	Bisexual. Pistillate.	Date of Full Bloom.	Date of first ripe Fruit.	Date of First Picking.	Date of last Picking.	Number of Pickings.	Weight of 25 average Berries.	Total Yield.
	Sex.						Oz.	Lbs. Oz.
Daisy	P.	June 8..	June 22..	June 23..	July 20..	12	$10\frac{3}{4}$	33— $2\frac{1}{4}$
Afton	P.	" 7..	" 20..	" 23..	" 20..	12	$6\frac{1}{4}$	31— 6
Stevens' Early	P.	" 6..	" 20..	" 23..	" 17..	10	$7\frac{3}{4}$	28— $5\frac{1}{2}$
Warfield	P.	" 8..	" 23..	" 25..	" 17..	10	$7\frac{1}{2}$	27— $6\frac{1}{2}$
Carleton	P.	" 8..	" 26..	" 27..	" 17..	8	$8\frac{3}{4}$	26— 2
Howard's 41	P.	" 9..	" 25..	July 2..	" 20..	7	$8\frac{3}{4}$	25— $2\frac{1}{2}$
Mattie Warfield	P.	" 8..	" 25..	June 25..	" 17 :	9	$5\frac{1}{2}$	22— $5\frac{1}{2}$
Mele	P.	" 7..	" 23..	" 27..	" 18..	8	$7\frac{1}{4}$	22— $3\frac{1}{2}$
Wonderful	P.	" 11..	" 28..	July 4..	" 20..	5	$6\frac{1}{4}$	22— $1\frac{1}{2}$
Bomba	P.	" 8..	" 23..	June 27..	" 13..	7	$7\frac{3}{4}$	21— $0\frac{3}{4}$
Buster	P.	" 9..	" 26..	" 28..	" 20..	8	$10\frac{3}{4}$	20— $8\frac{3}{4}$
Maggie	P.	" 6..	" 20..	" 23..	" 17..	9	$7\frac{1}{4}$	19— $8\frac{1}{4}$
Stone's Early	P.	" 8..	" 22..	" 23..	20..	11	$5\frac{1}{4}$	19— 4
Judsonia	B.	" 8..	" 25..	" 28..	" 20..	8	$7\frac{1}{2}$	19— $3\frac{1}{4}$
Thompson's Late	P.	" 6..	" 28..	" 30..	" 20..	7	$4\frac{1}{2}$	18—$15\frac{1}{2}$
Glen Mary	B.	" 8..	" 23..	" 27..	20..	9	11	18—12
Swindle	P.	" 8..	" 23..	" 27..	20..	8	$8\frac{1}{4}$	17—$11\frac{1}{4}$
Williams	B.	" 8..	" 25..	July 4..	14..	5	$7\frac{1}{2}$	17— $9\frac{1}{2}$
Enhance	B.	" 7..	" 25..	" 2..	" 20..	7	$9\frac{1}{2}$	16— 4
Sam Sperry	B.	" 9..	July 2..	" 4..	" 20..	5	$7\frac{1}{2}$	15—$14\frac{3}{4}$
John Little	P.	" 8..	June 18..	June 23..	" 17..	10	$4\frac{5}{8}$	15—11
No Name	B.	" 8..	" 23..	" 25..	" 13..	8	$9\frac{1}{2}$	15— $9\frac{3}{4}$
Hattie Warfield	P.	" 8..	" 25..	" 27..	" 17..	7	7	15— $9\frac{1}{2}$
Dora	P.	" 8..	" 25..	" 25..	" 17..	8	6	15— $4\frac{1}{2}$
Satisfaction	B.	" 8..	" 27..	July 2..	" 17..	6	$9\frac{1}{4}$	15— 2

Although the twenty-five varieties in the preceding table yielded better than any other sorts this year, they are not necessarily, on that account, the best kinds to plant, as some of them do not always yield as well, while others are not of good size or quality.

The following twenty-one varieties, of which descriptions are given, are the best of all those which have been tested at the Central Experimental Farm during the past few years; the experience of other growers being also taken into consideration in the selection:—

Afton, P.—Fruit above medium size, round-conical, regular, firm, deep glossy red, acid. Quality medium. Season medium. Plant a strong grower. This proved a heavy cropper this year. The fruit is attractive looking, resembling Warfield very much.

Beder Wood, B.—Fruit medium size, round-conical, regular, rather soft, pale red, acid. Quality medium. Season early. Plant a strong grower. Although this variety does not appear among the twenty-five yielding best this year, it has yielded well here in the past and has given good satisfaction elsewhere. It is specially useful as a pollinator of other early sorts.

Bubach, P.—Fruit large to very large, wedge-conical, irregular, bright red, moderately firm, sub-acid. Quality good. Season medium. Plant healthy, but does not set many runners. It is a favourite amateur berry, and is well adapted for the hill system. It is not productive enough to be grown extensively for commercial purposes except on very rich ground.

Brandywine, B.—Fruit above medium to large, roundish or sugarloaf in shape, firm, deep red, brisk sub-acid, good flavour. Quality very good. Season late. Plant a strong grower. This is rather an uncertain berry, but when the season is favourable it does well, and on account of its lateness and fine flavour should be planted in the home garden.

Buster, P.—Fruit large, roundish, regular, bright, but inclined to be pale red, moderately firm, juicy, sub-acid. Quality above medium. Season medium to late. Plant a strong grower. This is a very productive variety of good size and attractive appearance, and it maintains its size well to the end of the picking season. It is one of the most promising varieties of those grown at Ottawa.

Carleton, P.—Fruit above medium size, roundish, regular, moderately firm, pale red, juicy, sub-acid, pleasant flavour. Quality good. Season late. Plant a strong grower. This is a productive seedling originated by Dr. W. Saunders, and on account of its late season should prove valuable.

Clyde, B.—Fruit large to very large, roundish, moderately firm, rather pale red, juicy, sub-acid, pleasant flavour. Quality good. Season medium. Plant healthy, but does not set runners freely. Has a small amount of foliage for the quantity of fruit. This is a very productive berry when given good culture on rich soil. Its popularity has increased more rapidly than any other variety during the past few years. It is rather light coloured for some markets, and not firm enough for others. Although this variety did not yield well enough this year to appear among the twenty-five most productive, in 1898 it yielded third best of 290 varieties.

Daisy, P.—Fruit above medium size, round-conical, rather soft, bright glossy red, juicy, acid. Quality medium. Plant a strong grower. Season medium. A very attractive looking berry, and the most productive this year. For a near market, where large berries of fine quality are not demanded, this should prove one of the most profitable sorts to grow.

Glen Mary, B.—Fruit very large, roundish to wedge-conical, irregular, moderately firm, bright red, juicy, sub-acid. Quality medium. Season medium. Plant a strong grower. This is one of the few large fruiting varieties which combine great productiveness with size of fruit, and is, therefore, a good kind for a commercial plantation.

Greenville, P.—Fruit large to very large, roundish or wedge-shaped, moderately firm, bright red, sub-acid, pleasant flavour. Quality good. Season medium. Plant

a strong grower. This has not proved among the most productive, but it is one of the best for home use or special market.

Haverland, B.—Fruit above medium to large, pointed-conical, irregular, moderately firm, light scarlet, sub-acid. Quality medium. Season medium. Plant a strong grower. Haverland has proved a very productive and profitable berry with some growers in the vicinity of Ottawa, but it has not yielded very well with us. It appears to succeed best on heavy soil; that at the Experimental Farm is light.

Howard's No. 41, P.—Fruit medium size, round or pointed-conical, firm, bright red, acid. Quality medium. Season late. Plant a very strong grower. This is one of the most productive late berries that has yet been tested. It yielded sixth best this year. Where late berries are required without reference to quality this should prove one of the most profitable kinds to plant.

Marshall, B.—Fruit large to very large, roundish, rather irregular, firm, dark red, sub-acid, high flavour. Quality very good. Season medium. Plant vigorous, but few runners are set. This is one of the finest strawberries in cultivation. Its great size, rich colour and excellent quality make it an almost ideal berry for the table. It is, however, not very productive and needs high cultivation to be profitable. It is well adapted for growing in the hill system.

Nick Ohmer, B.—Fruit large, roundish, firm, deep red, sub-acid. Quality good. Season medium to late. Plant vigorous. Has not so far proved productive, but is a berry of fine appearance and would sell well. It is well spoken of elsewhere.

Parker Earle, B.—Fruit large, roundish, elongated, moderately firm, rather pale red, sub-acid. Quality above medium. Season late. Plant a strong grower. In some places the Parker Earle has given great satisfaction on account of its productiveness. At the Experimental Farm it has not done as well as many others.

Ridgeway, B.—Fruit medium size, roundish, firm, bright red, sub-acid. Quality good. Season late. Plant a strong grower, but does not set runners freely. Has not yielded well at the Experimental Farm, but has done well elsewhere.

Sample,P.—Fruit large, pointed-conical, moderately firm, bright red, acid. Quality above medium. Season medium to late. Plant a strong grower. Has not been long enough tested here to thoroughly ascertain its merits. Well spoken of elsewhere.

Stevens' Early, P.—Fruit medium to above medium size, pointed-conical, sometimes round-conical, firm, bright to deep glossy red, acid. Quality medium. Season early. This variety was much the most productive early sort tested this year.

Warfield, P.—Fruit above medium to medium size, pointed-conical, moderately firm, deep glossy red, acid. Quality medium. Season fairly early. Plant is a very strong grower and one of the hardiest. This variety has proved one of the best commercial berries at the Central Experimental Farm. Its hardiness, great productiveness and attractive and regular shaped fruit are the chief points in its favour.

Williams, B.—Fruit large, wedge-conical, firm, deep glossy red, the tip often remaining white when the rest of the berry is ripe, sub-acid. Quality good. Season medium. Plant a strong grower. While this berry is not a good one from the consumer's point of view, on account of the white tip, and also, often the hard core, it has proven very profitable to many growers, as it is productive and ships well.

William Belt, B.—Fruit large to very large, rather irregular, varying from wedge-conical to pointed-conical, the largest berries being cockscomb in shape. It

is firm, bright red, brisk sub-acid. Very good quality. Season late. Plant a strong grower, but has not proved perfectly hardy here ; this defect, however, has not been heard of elsewhere. It is said to rust badly, but this has not been the experience at Ottawa. One of the best berries for home use.

Other comparatively new sorts which are being tested and which appear promising are : McKinley, Klondyke, Hood River, and Gladstone. The Senator Dunlap and Rough Rider, two varieties which have been much advertised recently, are also being tested. Mayflower was one of the most promising extra early varieties which fruited this year.

Of the twenty-one varieties described, the following are specially recommended for general and special markets and for home use. None of these varieties are extra early sorts, as it has been found that most of the very earliest kinds, such as Michel's Early, are such poor croppers that they are unprofitable. As it is important when planting varieties to plant those which bloom at the same time in close proximity, the dates of blooming of the different kinds are included in the table.

VARIETIES RECOMMENDED FOR A GENERAL MARKET.

Variety.	Sex.	Season.	Date of First Bloom.	Date of Full Bloom.	Date of 1st Picking.	Date of Last Picking.
			1900.	1900.	1900.	1900.
Warfield	Pistillate	Early	June 1	June 8	June 25	July 17
Beder Wood	Bisexual	"	May 30	" 7	" 23	" 17
Clyde	"	E'ly to Med.	June 4	" 9	" 27	" 20
Glen Mary	"	Medium	" 1	" 8	" 27	" 17
Haverland	"	"	" 1	" 8	" 27	" 20
Williams	"	"	" 1	" 8	" 23	" 17
Buster	Pistillate	Late	" 4	" 9	" 28	" 20
Howard's No. 41	"	"	" 4	" 9	July 2	" 20

VARIETIES RECOMMENDED FOR A SPECIAL MARKET OR FOR HOME USE.

Marshall	Bisexual	Medium	June 1	June 8	June 27	July 17
Bubach	Pistillate	"	" 4	" 9	" 27	" 17
Greenville	"	"	" 1	" 8	" 25	" 17
Nick Ohmer	Bisexual	Med. to late	" 4	" 9	" 27	" 18
William Belt	"	Late	" 4	" 9	July 4	" 17
Brandywine	"	"	" 4	" 9	June 30	" 20

SEEDLING FRUITS.

Comparatively few seedling fruits were received for examination this year, and of these none were better or as good as the named varieties which succeed well in the districts from which the seedlings were sent. While it is very desirable that all seedlings of merit should become known, it has not been thought necessary to describe at full length any of the following kinds. As the collection of named varieties and unnamed seedlings is now very large at the Central Experimental Farm, there is a good opportunity of comparing the seedlings sent in with the best apples of the same season grown at Ottawa, and it is hoped that any who have seedlings whose merits they would like judged will send them to the horticulturist for this purpose.

No. 191—Robt. Hamilton, Grenville, Que.—Apple resembling La Victoire.

No. 192—Jules Lagace, St. Hilaire, Que.—Large streaked apple of medium quality.

No. 193—G. H. Caughell, Aylmer, Ont.—Medium sized, yellow, sweet summer apple.

No. 194—Thos. Orgill, Glen Orchard, Ont.—Small, red crab-like apple of rather poor quality.

No. 195—W. H. Lambert, Vanbrugh, Ont.—A medium sized, streaked, autumn apple of good quality.

No. 196—Alex. Skinner, Lindsay, Ont.—One of the most promising of those received. Large, red; quality above medium. Season, autumn.

No. 197—A. Clifford, Richard's Landing, Ont.—A large handsome apple, somewhat resembling Ben. Davis. Quality, medium. May be useful in the north.

No. 198—J. P. Cockburn, Gravenhurst, Ont.—An apple of medium size, splashed and washed with bright red on sunny side. Quality, above medium ; season, probably early winter.

No. 199—J. P. Cockburn, Gravenhurst, Ont.—Nora, medium size, oblong apple. Quality, above medium. Season, probably December to February.

No. 200—J. P. Cockburn, Gravenhurst, Ont.—Sally Brown, above medium size, oblate, splashed and streaked with red. Past condition for judging quality, Season, autumn.

No. 201—J. P. Cockburn, Gravenhurst, Ont.—Brydon Seedling ; medium sized, red, winter apple of medium quality.

No. 202—Wm. Spreadborough, Bracebridge, Ont.—Willen, a small, red winter apple of good quality. May prove valuable in the north.

SPRAYING.

As the advantages of spraying have been thoroughly proven and demonstrated by men who have been employed by the Government to do this work, and as the matter has been written about time and again in reports, bulletins, periodicals, newspapers, and spraying calendars, one might be led to think that all farmers and fruit growers would now spray their trees as a matter of course, just as they plough their fields. But this, unfortunately, is not the case, and there is still a large proportion of men engaged in fruit growing who do not spray. There is also another class of men who, knowing that spraying with Bordeaux mixture and Paris green will materially lessen the amount of scab and codling moth, do spray their trees, but are not satisfied with the results ; the reason of the poor success being, either that the mixture is not properly made, the trees are not sprayed thoroughly, or the spraying is not done at the proper time. Spraying is an expensive operation, and it is surprising that so many continue to waste hard-earned money by not doing the work properly. The early sprayings are the important ones, and these are too often neglected on account of press of other work, and when spraying is begun it is often too late to be of much service. A certain number of sprayings are suggested in the spraying calendars, and the times when they should be made. It should, however, be impressed on those who spray, that if heavy rain occurs before the mixture has dried on the trees, it will be washed off and the work must be done over again. The neglect of this is probably one of the chief causes of poor success in spraying. Spraying should be done thoroughly, and the underside of the leaves should receive as much of the spray as the upper sides. Every leaf or fruit missed means a foothold for disease or insect pests.

In preparing the mixtures and solutions, the formulæ given on the spraying calendars prepared by the Central Experimental Farm and similar institutions, should be followed as closely as possible. If a man knows the chemical composition of the materials he uses, and has made a special study of spraying, he may alter them slightly to meet certain circumstances, but if his knowledge of the materials used goes no further than the name, he should follow the instructions closely. He should also do his spraying at the seasons suggested. A delay of a few days may mean the loss of practically all the mixture or solution used without getting anything in return.

EXPERIMENTS WITH LIME MIXTURES FOR THE ERADICATION OF SCALE INSECTS.

During the winter of 1898-9, experiments were conducted at the Central Experimental Farm in the whitewashing of trees to retard the swelling of the buds in spring. Among the trees sprayed were some apple trees which were infested with the oyster-shell bark-louse. When the whitewash came off the trees during the summer it was found that they were practically free of that insect. The old scales had disappeared and scarcely any new ones could be found. The bark of the trees was much brighter and cleaner also than those which had not been sprayed. No notes had been taken as to how much the trees had been infested with the scales the previous autumn, but there was good evidence to show that they had been there. There had been 6 trees sprayed and they were all nearly equally clean. The formula used for the wash was lime, 60 pounds ; water, 24 gallons ; skim milk, 6 gallons. A thick mixture and one rather hard to get through the spray pump, but it made a good wash for the purpose it was intended, namely, to whiten the trees.

Although such good results had been obtained, it was not known at that time whether the strong mixture or the number of sprayings had most to do with the removal of the scales. The trees had been sprayed six times. If it were necessary to spray as often as that to rid the trees of the oyster-shell bark-louse it would not prove an economical practice. Experiments were therefore planned to discover, if possible, how many applications were necessary.

Following are the results obtained. The formula used was simply 2 pounds lime to 1 gallon of water. Notes were taken before spraying the trees as to how badly each tree was infested with the scales. The trees were sprayed on November 17, 20, 27, and December 7, 1899. The mixture did not stick nearly as well as when skim milk had been used the previous winter and was peeling off badly ten days after it was applied. The words 'slightly', 'considerably' and 'badly', indicate the degree of infestation, and while not exact, give an idea of the amount of scales on the trees. When only a few scales are said to be on the trees it means that the tree was practically rid of them and only an occasional scale could be found.

EXERIMENT MADE IN NOVEMBER AND DECEMBER, 1899.

Formula Used. Number of Trees Sprayed. Number of Times Sprayed.	How Infested before Spraying, November, 1899.	How Infested after Spraying, November, 1900.
2 lbs lime ; 1 gallon water.		
5 trees Sprayed twice	All considerably	Three with scarcely any scales left ; two slightly.
6 trees Sprayed three times.....	Four badly ; two considerably...	Three with scarcely any scales left ; one slightly ; two considerably.
2 trees. Sprayed four times	One considerably ; one badly....	Only a few scales left on both.

The results obtained in this experiment were very convincing. It was clearly proven that it was not necessary to add anything to the mixture for the purpose of making it stick better to the tree, as the loosening of the scales by the lime must have occurred within the first two weeks after the mixture was applied, as the wash was cracking off badly within ten days after the trees received the second application. It was also clearly shown by this experiment that two sprayings were quite sufficient to give satisfactory results.

EXPERIMENT MADE IN MARCH, 1900.

The experiment tried in the autumn of 1899 had afforded much proof that it was the caustic property of the lime which had been the means of loosening the scales and that there need not be many applications to get the results desired. From this evidence experiments were planned for the purpose of determining, if possible, the minimum strength of lime necessary to obtain satisfactory results and also to get further proof regarding the number of sprayings which it was necessary to make. Up to that period the time of the year at which it was best to do this work had not been given serious attention, as it was thought that any time when the trees were dormant would do.

The following table gives the various formulæ used, the dates of application and the results obtained. The sprayings were made during the month of March.

EXPERIMENT MADE IN MARCH, 1900.

Formula Used. Number of Times Sprayed.	How Infested before Spraying, March, 1900.	How Infested after Spraying, December, 1900.
1 lb. lime ; 1 gallon water.		
Sprayed twice	Both considerably	One slightly ; only a few scales left on the other.
" three times	" "	Both slightly.
" Four times	" "	One still considerably ; only a few scales left on other.
1 lb lime ; 1 gallon water ; 1 quart. skim milk.		
Sprayed twice	Both considerably	Both slightly.
" three times	" "	One slightly ; only a few scales on other.
" four times	One badly ; one considerably	One badly ; one considerably.
2 lbs. lime ; 1 gallon water.		
Sprayed twice	Both badly	Only a few scales left on each.
" three times	"	Both considerably.
" four times	"	One Badly ; one considerably.
2 lbs. lime ; 1 gallon water ; 1 quart. skim milk.		
Sprayed twice	Considerably (one tree)	Considerably.
" three times	Both considerably	One slightly ; a few scales left on other.
" four times	" "	One slightly ; one considerably.
3 lbs. lime ; 1 gallon water.		
Sprayed twice	Both badly	One slightly ; one badly.
" three times	"	One badly ; a few scales left on other.
" four times	"	One slightly ; one considerably.
2 lbs. lime ; 1 gallon water ; 1 quart. skim milk ; 5 oz. salt.		
Sprayed twice	Both badly	One slightly ; one considerably.
" three times	"	One slightly ; a few scales left on other.
" four times	"	Both badly.

The results obtained from the experiments tried in March, 1900, are rather conflicting. One accurate conclusion, however, may be drawn, namely, that autumn, and not late winter or spring, is the best time to spray the trees for this purpose.

As large a proportion of scales appear to have been removed by the thinnest washes in this experiment as by the thickest. It would seem, from some of the results obtained, that the thicker and stickier mixtures had the effect of glueing the scales to the trees, thus counter-balancing in a greater or less degree the action of the lime in loosening them. In all cases, many scales were removed from the trees, but a few were so badly affected that they were still badly affected after being sprayed.

EXPERIMENT TO DETERMINE IF THERE WOULD BE ANY INJURY TO THE TREE FROM LIME IF APPLIED WHEN BUDS WERE BURSTING.

As it was not known whether the lime would have any injurious effects on the young growth of the trees (no injury having been observed when the trees were sprayed when dormant), the following experiment was made:—

An apple tree which was considerably infested with bark-louse, was chosen for this purpose. The formula used for the first spraying was 2 pounds lime, 1 gallon water, 1 quart skim-milk, 5 ounces salt; and for the second spraying the same, without the salt. At the time of the second spraying the leaf buds were bursting. The lime covered the young leaves, which were just showing, and no injury resulted. The tree bloomed freely, and there evidently had been no injury to the flower buds. The young lice began running at the usual time.

EXPERIMENT TO DETERMINE THE EFECT OF A LIME MIXTURE ON THE SAN JOSE AND NEW YORK SCALES.

An experiment was tried at Niagara in December, 1899, to determine if a lime mixture sprayed on peach trees would have any effect on the San José scale. Ten trees were used, all of which were more or less infested with it.

Three trees received one application; two trees, two applications; two trees, three applications; and three trees, four applications. The various sprayings were made between December 21, 1899, and January 4, 1900. The formula used was 60 pounds lime, 10 pounds salt, 6 gallons skim-milk, and from 28 to 30 gallons water. A very thick and strong mixture.

The trees were examined on June 21, 1900, but no injury to the scales could be detected.

Four plum trees which were infested with the New York scale were sprayed on December 21, 1899, with the same mixture. Two trees received one application and two, two applications. These trees were also examined on June 21, 1900, but the lime had evidently not had any effect on this insect either.

No injury was caused to either the plum or peach trees by the use of the lime mixture.

EXPERIMENTS IN PROGRESS.

Experiments are in progress this winter to determine, if possible, the most economical and satisfactory formula to use in spraying to eradicate the oyster-shell bark-louse.

HOW TO MAKE AND APPLY THE LIME MIXTURE.

Only good stone lime should be used. The lime is slaked in warm water, stirring it so that it will slake well, and the remainder of the water is then added, and the whole thoroughly stirred. It is then strained through a sieve having a mesh about one-twelfth inch in diameter, and is ready for use. A mild day should be chosen, so that the mixture may have a chance to flow about the scales without freezing. It is more satisfactory to apply the mixture while it is yet warm. A less strength than 2 pounds of lime to 1 gallon of water can be sprayed through a large barrel pump without danger of clogging, but if 2 pounds or more to 1 gallon is used it is necessary to use a smaller pump so that it may be cleaned easier should it clog.

CONCLUSIONS REACHED UP TO NOVEMBER 1900.

1. Lime slaked in water and sprayed on apple trees infested with the oyster-shell bark-louse has the effect of loosening the scales.

2. The scales, when loosened, are removed from the trees by rain, ice, wind, and probably by other means.

3. As the scales contain the eggs from which the young insects hatch about June 1, it is necessary, in order to get the best results, that the trees be sprayed as soon as possible after the leaves fall in autumn, so that the loosened scales may be exposed to the weather for a long time before the eggs hatch.

4. The lime appears to have no injurious effect on the eggs within the scales.

5. Lime used in various proportions in the several experiments had no apparent injurious effects on apple or peach trees. Even when the leaf buds were opening no injury occurred.

6. As the action of the lime seems to occur soon after the trees are sprayed, it is not necessary to use any substance other than water to help bind it to the tree. On the contrary, it would appear that such substances counterbalance the effects of the lime, for a time, by glueing the scales to the trees.

7. It is important to use good stone lime, which has not been air-slaked.

8. As no experiments were conducted in the autumn of 1899, to determine what proportion of lime was necessary to get satisfactory results, and as it has been found that spraying in late winter or early spring is not a very good time, it is not possible yet to say what is the most economical formula to use. As nearly all the scales were removed from some of the trees, which were sprayed with 1 pound lime to 1 gallon water in March, 1900, it is quite likely that satisfactory results will be obtained by using that mixture in the autumn.

9. It is necessary to make at least two applications, as those scales with which the mixture does not come in contact will not be effected by it, and it is not possible to do the work thoroughly with one spraying.

10. The lime mixture applied in winter evidently has no effect on the San José or New York scales.

11. The bark of trees sprayed with the lime mixture is much brighter afterwards than on trees not sprayed, and it is possible that many fungus germs are destroyed.

COVER CROPS.

The importance of cultivating orchards has for ten years or more been impressed upon fruit growers in America, on every possible occasion. It has been found, however, after several years' experience that the constant stirring of the soil lessens the amount of humus in it to such an extent that in districts where droughts occur frequently it becomes a burning question how to restore humus cheaply to the soil ; for as soil with plenty of humus holds moisture better than soil with little of it, the amount of moisture conserved by cultivation is becoming less every year where humus is not restored. Of late years there have been some severe winters, when fruit trees were root-killed by the thousands, and thus another question arose as to how best to protect the roots of the trees sufficiently to save them. Thus developed the value of the so-called 'cover crop,' which, although it had been grown by many fruit growers for years back, did not become a prominent feature in Canadian horticulture until the last six or seven years.

At the Central Experimental Farm the importance of cover crops has been fully recognized, and experiments have been conducted with them since 1895, and in the horticulturist's reports for 1896, 1897, 1898 and 1899, the experience which had been obtained concerning the different plants used for this purpose, and other matters concerning them, was published.

The best time to sow seed for a cover crop is sometime in the month of July, preferably about the middle, as the growth of the fruit trees is well advanced by that time, and the fruit itself well developed. The seed should be sown, if possible, when the ground is moist, as at that time of year it will germinate quickly if there is moisture. At the Central Experimental Farm it has been found that Common Red clover or Mammoth Red clover, sown broadcast at the rate of 12 pounds per acre, gives the best results, although on light soil, Lucerne, sown at the rate of 15 pounds per acre, will grow taller by autumn and hold the snow better. After the seed is sown the land should be rolled, as this will bring the moisture to the surface and about the seed and hasten germination. It is important to get growth started in good time, as there is often protracted drought in July and August which prevents germination and spoils the prospect for a good cover crop. Buckwheat and rye also make good cover crops, but the advantage of using clovers is that they are what are known as leguminous plants, and these assimilate nitrogen from the air through the nodules on their roots; thus, by using this class of plants, nitrogen, the most expensive plant food, may be had for the price of the seed. The Hairy Vetch (*Vicia villosa*) has given good satisfaction where it has been tested. In dry districts where it is difficult to get a catch of clover, this is likely to prove very valuable. It grows until late in the autumn, as it takes a severe frost to kill it. It also belongs to the leguminous class of plants. It has not proved hardy at Ottawa, though as yet only tested in small plots.

In the spring the clover may be let grow until there is a good crop to plough under, but in those districts where drought is likely to occur in the summer, it is much better to plough the land as soon as it can be worked, without waiting for any new growth. The following figures, taken from Bulletin 164, of the Michigan Experiment Station, show how much moisture may be saved by ploughing early:—

'Two tests were made in Field No. 6. The ploughing was done May 2. Samples were taken for determination of moisture on May 10 and 17, with the following results:—

May 10.	1st Foot.	2nd Foot.	3rd Foot.	Average 3 ft.
	Per cent.	Per cent.	Per cent.	Per cent.
Spring ploughed	10·50	10·07	8·04	9·54
Not ploughed	10·10	8·12	7·26	8·49
	·40	1·95	·78	1·05
May 17.				
Spring ploughed	9·33	6·75	6·97	7·68
Not ploughed	8·78	5·92	6·82	7·17
	·55	·83	·15	·51

'This gives a difference in the first instance of 2·8 pounds per square foot to a depth of 3 feet, and of 1·4 pounds in the second instance, in favour of the land ploughed early in the spring.

'Experiments tried by Professor King, and reported in the Wisconsin Report for 1891, pages 101 and 102, show larger differences. The ploughing was done on April 29 and samples taken on May 6, showing a difference for the upper 3 feet of 7·02 pounds of water per square foot. On another plot the observed difference of the samples taken on May 14 to the same depth was 4·65 pounds.

These determinations all show that to have as large a supply of moisture as possible for the crop it is necessary to plough or work the soil in some way to form

a mulch to prevent evaporation as early in the spring as the condition of the land will allow.

The advantages, then, of a cover crop are, first, that the mass of foliage and stems which it produces helps to prevent the frost from going deep into the soil, and also prevents, to a large extent, that thawing and freezing of the soil in the spring which is so harmful to the roots of trees.

2nd. The cover crop helps to prevent the snow from blowing away, and thus a thicker covering is formed for the protection of the roots of the trees.

3rd. Humus is added to the soil by ploughing it under, thus increasing its water-holding capacity and fertility.

4th. Nitrogen is added to the soil without other expense than the price of the seed.

5th. A cover crop growing in the orchard in autumn will utilize plant food, which has been made available during the summer, and thus prevent it from leaching away. It thus becomes a 'catch crop' as well.

LIST OF BEST VEGETABLES FOR FARMERS.

As all the experiments which are conducted with vegetables cannot be published every year on account of want of space, a list of the varieties of all the principal kinds which have proved the most satisfactory after several years' tests was published in the report for 1899 under the heading 'List of best Vegetables for Farmers.' This gave in a concise form much valuable information as to the best varieties to plant and must have proved very helpful to those who studied it. As the annual reports are very liable to be mislaid during the year, and as one is apt to forget the name of a variety, it has been thought advisable to again publish this list with what changes another year's experience warrants making.

Asparagus.—Connover's Colossal is the best all-round variety.

Beans.—Golden Wax or Wardwell's Kidney Wax, for early crop; Early Refugee, for medium; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Southern Crease-back and Asparagus (early) and Golden Andalusia (late) are the best pole varieties.

Beets.—Egyptian Turnip, Eclipse and Bastian's Blood Turnip are three of the best varieties.

Borecole or Kale.—Dwarf Green Curled Scotch is the best.

Broccoli.—White Cape.

Brussels Sprouts.—Improved Dwarf is the most satisfactory.

Cabbage.—Early Jersey Wakefield (early), Succession (medium); Late Flat Dutch, Drumhead Savoy (late), Red Dutch (red), is a select list of the best varieties of cabbage.

Cauliflowers.—Extra Early Dwarf Erfurt and Early Snowball (early); Kronk's Perfection (medium) and Large Late Algiers are among the best.

Carrots.—Chantenay and Guerande or Oxheart are two of the best carrots, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching, Paris Golden Yellow, Improved White Plume, White Walnut (early); London Red, Perfection Heartwell, White Triumph (late) are among the best.

Corn.—Early White Cory, Crosby's Early, Henderson's Metropolitan (early); Perry's Hybrid, Stabler's Early, Early Evergreen (medium); Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably, and is of fine quality.

Cucumbers.—Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling is a good pickling sort.

Egg Plants.—New York Improved and Long Purple succeed best.

Lettuce.—Black Seeded Simpson, New York (curled), Tennis Ball, Salamander and Golden Queen (cabbage); Trianon and Paris Cos lettuce make a good list.

Melons, Musk.—Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type, and Surprise, Bayview, Paul Rose and Emerald Gem, of the other types, are all good.

Melons, Water.—Cole's Early, New Imperial, Ice Cream, and Phinney's Early are early water melons of excellent quality.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best onions in cultivation.

Parsnips.—Hollow Crown and Dobbie's Selected are both good sorts.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Cardinal, Squash and Golden Dawn are four of the best.

Pease.—Gregory's Surprise, Gradus, Nott's Excelsior and Premium Gem (early); McLean's Advancer, Improved Stratagem and Heroine (medium). None of these are tall growing varieties. Juno (dwarf), Telephone, Veitch's Perfection (tall), (late). Nott's New Perfection is a promising second early sort, and Dwarf Telephone and Startler two promising late varieties.

Potatoes.—Extra Early: Early Ohio and Early Andes (pink), Bovee and Burpee's Extra Early (pink and white). Early: Everett and Rochester Rose (pink), Early Puritan (white). Medium: Carman No. 1 (white), Empire State (white). Late: Late Puritan (white), American Wonder (white), Rural Blush (pink).

Radishes.—Early: Rosy Gem, French Breakfast, Red Rocket (red) and Icicle (white). Late: White Strasburg, Long White Vienna. Winter: Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Linnæus and Victoria are the most satisfactory.

Salsify.—Long White is the best.

Spinach.—Victoria and Thick-leaved are the best.

Squash.—Early: White Bush Scalloped and Sumer Crook Neck. Late: Hubbard.

Tomatoes.—Early: Conqueror, Dwarf Champion, Canada Victor and Early Ruby. Main Crop: Brinton's Best, Livingston's Favourite, Matchless, and Baltimore Prize Taker.

There are many varieties of this vegetable which are almost equal in excellence and productiveness. Spark's Earliana is a promising early sort tested this year.

Turnips.—Early: Extra Early Milan and Red Top Strap Leaf. Swedes: Champion Purple Top, Skirving's Improved.

EXPERIMENTS WITH POTATOES.

This was a very good season for potatoes, and the yields were high in consequence. There was just enough rainfall to keep the ground moist all summer without it becoming too wet, and the vines made rapid and vigorous growth. There was no blight, and the potatoes appeared to ripen quite naturally.

There were 117 varieties tested at the Central Farm this year, of which the Sabean's Elephant, a comparatively new sort, gave the best crop, the yield being at the rate of 589 bushels 36 pounds per acre. The poorest yield was 209 bushels per acre, the difference in yield between the best and poorest being 380 bushels 36 pounds per acre. The average yield per acre from all the varieties tested was 417 bushels 37 pounds, being about two and three-fourths times as much as the average of Ontario this year.

If, however, these varieties had been grown by the acre instead of in small plots the yields would not have been so large, but as the poorest yielder gave about one and three-fourths times as much per acre as the average for Ontario, something must be wrong with the system of cultivating potatoes, generally adopted, or with the varieties planted.

The soil in which the potatoes were grown this year was a sandy loam, where a strawberry plantation had been the previous season. In the autumn of 1899, after the strawberry plants had been ploughed under, fall rye was sown on September 15, at the rate of two bushels per acre. On May 18, 1900, the rye was ploughed under. The land was then disc harrowed, and harrowed twice with the smoothing harrow. Drills were made about four or five inches deep and 2½ feet apart, and the sets, which were of about the same size, and with at least three eyes and a good amount of flesh, were dropped 1 foot apart, each variety occupying one row 66 feet long. The potatoes were covered with the hand hoe to get as uniform conditions as possible. The soil was harrowed once before the potatoes were up to kill any weeds which had germinated and to level the ground. The surface soil between the rows was kept loose by the cultivator until the vines met, but the latter were not hilled up, level culture being adopted. The vines were sprayed with Paris green and Bordeaux mixture to destroy the potato beetle and prevent blight. The potatoes were planted on May 25 and 26, and dug on October 9, 10 and 11.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Sabean's Elephant	Good	589	36	528	..	61	36	White.
Vanier	Poor to med.	576	24	523	36	52	48	Red.
Enormous	Good	561	..	499	24	61	36	White.
Canadian Beauty	"	547	48	490	36	57	12	Pink and white.
Irish Cobbler	"	532	24	484	..	48	24	White.
Early Sunrise	"	532	24	473	..	59	24	Pink.
Burnaby Mammoth	"	530	12	453	12	77	..	Pink and white.
Rose No. 9	Medium	528	..	484	..	44	..	Pink.
Northern Spy	Poor	525	48	492	48	33	..	Bright pink.
Flemish Beauty Seedling	"	525	48	473	..	52	48	"
Burnaby Seedling	Good	525	48	464	12	61	36	Pink and white.
Empire State	"	519	12	466	24	52	48	White.
Money Maker	"	517	..	466	24	50	36	"
General Gordon	"	517	..	459	48	57	12	Pink.
Polaris	"	502	42	448	48	53	54	White.
Late Puritan	"	492	48	420	12	72	36	"
Seattle	Medium	490	36	444	24	46	12	"
American Wonder	Good	488	24	457	36	30	48	"
Rural No. 2	"	488	24	453	12	35	12	"
Swiss Snowflake	"	486	12	431	12	55	..	"
Peachblow		481	48	426	48	55	..	"
State of Maine	Good	481	48	424	36	57	12	"
Vick's Extra Early	"	481	48	404	48	77	..	Pink and white.
Rose of the North		479	36	396	..	83	36	Pink.
Rawdon Rose	Good	477	24	404	48	72	36	Pink and white.
New Queen	"	475	12	426	48	48	24	" "
Sharpe's Seedling	"	475	12	398	12	77	..	" "
Rochester Rose	"	470	48	413	36	57	12	Pink.
Early St. George	"	468	36	409	12	59	24	Pink and white.
American Giant	Medium	464	12	422	24	41	48	White.
Seedling No. 230	"	464	12	387	12	77	..	"
Early Market		462	..	440	..	22	..	Pink.
Early Norther	Medium	462	..	409	12	52	48	"
Rural Blush	Good	459	48	435	36	24	12	"
N. Bergeron		457	36	444	24	13	12	White, pink eye.
Dreer's Standard	Good	457	36	435	36	22	..	White.
Maule's Thoroughbred		457	36	426	48	30	48	Pink.
Brown's Rot Proof	Medium	455	24	440	..	15	24	"
Reeves Rose		455	24	387	12	68	12	"
I. X. L.	Good	451	..	396	..	55	..	Pink and white.
Jubilee	"	451	..	418	..	33	..	" "
White Elephant		446	36	415	48	30	48	" "
Columbus		446	36	411	24	35	12	" "
Penn Manor		446	36	378	24	68	12	" "
Napoleon	Good	446	36	369	36	77	..	Pink.
Vigorosa		444	24	374	..	70	24	Pink and white.
From A. S. Brosseau		442	12	426	48	15	24	Red and white.
Holborn Abundance	Medium	442	12	413	36	28	36	White.
Clay Rose	"	440	..	400	24	39	36	Pink.
Lee's Favourite	Good	437	48	363	..	74	48	"
Troy Seedling	Medium	437	48	360	48	77	..	White.
Uncle Sam		435	36	418	..	17	36	"
Burbank's Seedling	Good	435	36	409	12	26	24	"
Country Gentleman		435	36	316	48	118	48	Pink and white.
Pearce		433	24	374	..	59	24	" "
Early Pride		426	48	385	..	41	48	Pink.
Carman No. 3	Good	424	36	407	..	17	36	White.
Early Six Weeks	"	424	36	391	36	33	..	Pink.
Early Harvest	"	422	24	365	12	57	12	"
Cambridge Russet	"	420	12	404	48	15	24	White.
Wonder of the World	"	420	12	387	12	33	..	Pink and white.
Green Mountain	"	420	12	385	..	35	12	White.
Thorburn	"	420	12	358	36	61	36	Pink and white.
Mill's Prize		420	12	343	12	77	..	White.

Potatoes—Test of Varieties—*Continued.*

Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Burpee's Extra Early	Good	418	..	352	..	66	..	Pink and white.
Early Rose	"	415	48	367	24	48	24	Pink.
White Giant		407	..	382	48	24	12	White.
Sir Walter Raleigh		404	48	365	12	39	36	"
Champion		402	36	360	48	41	48	"
Everett	Good	402	36	345	24	57	12	Pink.
Great Divide	"	400	24	387	12	13	12	White.
Doherty's Seedling		400	24	356	24	44	..	"
Delaware	Good	400	24	321	12	79	12	"
Dakota Red	Medium	400	24	338	48	61	36	Red.
Early Puritan	Good	400	24	332	12	68	12	White.
Daisy	"	391	36	343	12	48	24	Pink and white.
Lizzie's Pride	"	389	24	325	36	63	48	Pink, red eye.
Early White Prize	"	385	..	369	36	15	24	White.
Bovee	"	385	..	325	36	59	24	Pink and white.
20th Century		382	48	330	..	52	48	White.
Carman No. 1	Good	380	36	352	..	28	36	"
McIntyre		380	36	352	..	28	36	" and purple.
Pearce's Extra Early	Good	378	24	363	36	14	48	Pink.
Early Andes	"	376	12	349	48	26	24	"
Seneca Queen	Very good	376	12	343	12	33	..	Pink & white with bright pink eye.
Harvest King		374	..	343	12	30	48	White.
Gem of Aroostook	Good	374	..	338	48	35	12	Pink and white.
Quaker City		374	..	334	24	39	36	White.
New Variety No. 1	Poor	374	..	299	12	74	48	"
White Beauty	Good	374	..	297	..	77	..	"
Irish Daisy	"	374	..	294	48	79	12	"
Prolific Rose		371	48	341	..	30	48	Pink.
Chicago Market	Good	369	36	341	..	28	36	"
Dark Red Seedling		367	24	341	..	26	24	Deep pink.
Pearce's Prize Winner	Good	367	24	294	48	72	36	Pink.
Rose of Erin		365	12	330	..	35	12	Pale pink, bright pink eye.
Early Ohio	Good	363	..	321	12	41	48	Pink.
Prize Taker	"	356	24	261	48	94	36	"
Livingston		354	12	314	36	39	36	White, pink eye.
Beauty of Hebron	Medium	347	36	277	12	70	24	Pink and white.
Light Red Seedling		341	..	310	12	30	48	Pink.
Livingston's Banner	Good	338	48	308	..	30	48	White.
Maggie Murphy	Medium	334	24	325	36	8	48	Bright pink.
Early Dawn		322	..	299	12	22	48	Pink, brighter at seed end.
Clarke's No. 1	Good	321	12	277	12	44	..	Pink.
Seedling No. 7	Medium	319	..	277	12	41	48	Bright pink.
Earliest of All	Good	319	..	250	48	68	12	Pink and white.
Early Michigan		310	12	259	36	50	36	
Hale's Champion	Poor	290	24	209	..	81	24	White.
Houlton Rose		272	48	206	48	66	..	Pink.
Brownell's Winner	Good	266	12	217	48	48	24	Red.
Pink Eye		255	12	220	..	35	12	
Reading Giant	Poor	244	12	220	..	24	12	Pink.
Ohio Junior		237	36	213	24	24	12	"
Seedling No. 214	Good	239	48	222	12	17	36	White.
Bill Nye		217	48	167	12	50	36	"
Pride of the Market	Good	209	..	154	..	55	..	"

TWELVE BEST YIELDING VARIETIES OF POTATOES—AVERAGE OF SIX YEARS' TESTS.

	Name of Variety.	Average yield per acre. Bush.	lbs.		Name of Variety.	Average yield per acre. Bush.	lbs.
1	Holborn Abundance	419	28	7	Burnaby Seedling	365	30
2	American Wonder	411	56	8	Vanier	362	49
3	Seedling No. 230	392	41	9	State of Maine	362	32
4	Late Puritan	389	43	10	Seattle	362	8
5	Empire State	378	17	11	Polaris	360	49
6	Everett	371	3	12	Early Norther	358	56

POTATOES—PLANTING AT DIFFERENT DISTANCES APART.

During the past five years an experiment has been tried in planting the sets at different distances apart in the rows; the rows in each case being 2½ feet apart. The best results have been obtained so far by planting the sets 12 inches apart, although it will require a few years yet before accurate conclusions can be drawn. There was very little difference in the proportion of marketable and unmarketable tubers in this experiment. In former years only one variety was used in this test, but this year two were planted; the Early Andes, an early variety, and the Uncle Sam, a comparatively late one. The average results from these two varieties are given as the yields per acre for 1900.

Distance apart of Sets.	Seed required per acre. Bush.	lbs.	Yield per acre, 1896. Bush.	lbs.	Yield per acre, 1897. Bush.	lbs.	Yield per acre, 1898. Bush.	lbs.	Yield per acre, 1899. Bush.	lbs.	Yield per acre, 1900. Bush.	lbs.	Average yield per acre, 5 years. Bush.	lbs.	Average yield per acre after deducting seed. Bush.	lbs.
10 inches apart..	34	50	355	18	331		268	24	392	2	327	48	334	54	300	4
12 " ..	29	2	336	36	278	47	347	36	406	34	316	48	337	16	308	14
14 " ..	24	53	323	24	268	50	290	24	454	58	325	36	332	38	307	45
16 " ..	21	46	335	30	226	1	233	12	392	3	279	24	293	14	271	28
18 " ..	19	21	289	18	226	31	253		234	34	270	36	254	48	235	27

POTATOES—PLANTING AT DIFFERENT DEPTHS.

An experiment has been conducted during the past three years in planting potatoes at different depths in rows 2½ feet apart and 12 inches apart in the rows. The sets had at least three eyes each, and were about uniform in size. The soil was sandy loam, both years. Level cultivation was adopted, and thus very little soil was thrown on the potatoes after they were covered at the time of planting. The following table shows that the best yields were obtained from planting the sets only 1 inch deep. As the relative yields from the different depths of planting have not been the same in both years, it will be necessary to continue this test for some time before accurate conclusions can be drawn. Notes were taken on the depths at which tubers were formed in 1899 and 1900, and it was found that most of them were within 4 inches of the surface of the soil, even where the set had been planted 6, 7 and 8 inches deep. Where the sets were planted less than 4 inches deep nearly all the tubers were formed between that and the surface of the soil. Two varieties, the Sir Walter Raleigh and Empire State, were used in the test this year, and the average results from them are given as the yields for 1900. There are several reasons why the potatoes planted from one to three inches deep should give the best results. Potatoes will develop more

rapidly in warm soil than in that which is cooler. The soil within the first three or four inches of the surface is warmer than that three or four inches lower down, hence the conditions are more favourable for the potato. The tubers when the potato is in the wild state develop near the surface or on the surface of the ground. It seems natural, therefore, that the cultivated potato should be planted shallow.

On the other hand, much of the success of shallow planting will depend on the moisture of the soil. If the season is very dry the first two inches of soil may be so dry that the potato will not take root readily, and the season of growth will thus be shortened, but this has not happened here during the past three years. Once the roots begin to grow they speedily reach a depth where plenty of moisture is found.

From the results obtained it seems reasonable to conclude that where the soil is not dry the best results can be obtained from shallow planting. In any case, early planted potatoes will probably succeed best when planted shallow, as the ground will be warmer. In places where the spring is late or where the ground is cold, best results will probably be had by shallow planting.

Although the best results have been obtained in sandy loam soil by planting the sets one inch deep, this method is not recommended for field culture. Unless the surface of the soil is kept loose and free from weeds the potato crop will not be large. In order to kill a large proportion of the weeds which grow, the ground should be harrowed once or twice before the potatoes come up or just as they are coming up. If the sets were planted only one inch deep and the soil harrowed, many of them would be dragged out, hence about four inches deep would be the best.

Depth of Planting.	Yield per acre, 1898.		Yield per acre, 1899.		Yield per acre, 1900.		Average Yield per acre, 1898-1900.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1 inch	347	36	532	24	468	36	449	32
2 inches	*244	12	469	28	462		358	33
3 "	281	36	493	41	422	24	399	13
4 "	277	12	520	18	404	48	400	46
5 "	290	24	474	19	334	24	366	12
6 "	264		421	5	367	24	350	49
7 "	290	24	392	3	336	36	339	4)
8 "	266	12	353	19	345	24	321	38

POTATOES PLANTED AT DIFFERENT DATES.

In 1898 an experiment was begun in planting potatoes at different dates, beginning when the main crop was put in and continuing at intervals of two weeks until August 23, 1898, July 23, 1899, and July 21, 1900. An early and a late variety were used in each case, the varieties being Early Norther and Irish Daisy, in 1898, Early Norther and Rural Blush, in 1899, and Early Norther and Sir Walter Raleigh, in 1900.

In 1898 and 1899 the decrease after the third planting was so great that it appeared as if a fair crop of marketable potatoes could not be produced when the seed was planted much after June 24, but the results obtained in 1900 by planting on July 7, go to show that it is possible to produce a good crop of potatoes after a crop of early vegetables, such as pease, has been removed. The yield of marketable potatoes planted from seed of Early Norther, planted on July 7, was at the rate of 224 bushels 24 pounds to the acre.

This experiment will be continued for several years yet.

*NOTE.—This great decrease in yield was probably due to a variation in the soil which it is sometime difficult to avoid.

Date of Planting.	Total Yield per Acre, 1898.		Total Yield per Acre, 1899.		Total Yield per Acre, 1900.		Yield per Acre Marketable, 1900.		Yield per Acre Unmarketable, 1900.		Average Total Yield per Acre, 1898–1900.		Average Yield per Acre Marketable, 1898–1900.		Average Yield per Acre Unmarketable, 1898–1900.	
Early Variety.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1st planting, May 26, 1898; May 26, 1899; May 26, 1900........	277	12	505	47	409	12	374	..	35	12	397	24	344	58	52	26
2nd planting, June 10, 1898; June 9, 1899; June 9, 1900..........	160	36	459	48	453	12	360	48	92	24	357	52	289	22	68	30
3rd planting, June 24, 1898; June 23, 1899; June 23, 1900........	125	24	237	10	365	12	303	36	61	36	242	35	193	54	48	41
4th planting, July 8, 1898; July 7, 1899; July 7, 1900..........	30	48	9	41	268	24	224	24	44	..	102	58	74	48	28	10
5th planting, July 23, 1898; July 21, 1899; July 21, 1900.........	1	6	....		26	24	....		26	24	9	10	....		....	
6th planting, August 9, 1898.....	....		....		....		....		....		....		....		....	
7th " " 23, 1898.....	....		....		....		....		....		....		....		....	
Late Variety.																
Planted on same dates as the early variety—																
1st planting...............	259	36	338	48	277	12	259	36	17	36	291	52	239	22	52	30
2nd "	173	48	164	34	338	48	277	12	61	36	225	43	162	22	63	21
3rd "	68	12	157	18	198	..	167	12	30	48	141	10	115	32	25	38
4th "	8	48	19	22	202	24	145	12	57	12	76	51	48	24	28	27
5th "	1	6	....		26	24	....		26	24	9	10	....		9	10
6th "	....		....		....		....		....		....		....		....	
7th "	....		....		....		....		....		....		....		....	

POTATOES—RECEIVED FOR TEST IN 1900.

Every year samples of potatoes are received for test which are either seedlings, not yet named, new named varieties, or varieties for identification. As the quantity received of each of these is usually smaller than that used in the uniform test plots, the comparison of yields between these and the named varieties would not be very conclusive. For this reason, the results from the samples this year are put in the following table :—

Name of Variety and Address of Sender.	Number of Sets Planted.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.	
		Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Red Rock from Jas. Carruthers, Magundy, N.B..........	16	642	24	580	48	61	36
From Geo. Pyke, Wolf Island, Ont......	66	563	12	532	24	30	48
Early Elkinah, S. Wile, Branch La Have, N.S	16	545	36	528	..	17	36
Churchill Seedling..................	66	525	48	492	48	33	..
Early Summer, R. A. Snason, Uxbridge, Ont............	33	514	48	440	..	74	48
Montana Bluff, Jas. Lamb, Walkerton, Ont.............	33	510	24	466	24	44	..
Dobson's Early, " "	33	497	12	453	12	14	..
Mammoth Pearl, " "	33	440	..	422	24	17	36
Wall's Orange, " "	33	422	24	396	..	26	24
Silver Dollar..	16	360	48	352	..	8	48
California Cup, Jas. Lamb, Walkerton, Ont.	16	264	.	228	48	35	12
Dutch, Blue, A. Ferguson, Port Morien, N.S...........	33	211	12	176	..	35	12

EXPERIMENTS WITH TOMATOES.

There were 167 varieties of tomatoes tested this year. A large number of these are probably synonyms, but seed under that number of names was offered for sale by Canadian and American seedsmen this year. Many of the varieties have now been tested five years, and it is proposed to discontinue growing all those which have not proved to be among the best.

The yields of the twenty-five best yielding varieties, only, are published, as space will not permit of a full table being given. In addition to this list, however, will be found the names of the six earliest varieties for this year, also the six wrinkled and twelve smooth varieties which have averaged the best yields in five years.

The seed of the tomatoes grown this year was sown in hot-beds on April 6; the young plants were pricked out into strawberry boxes on April 30, and planted in the open ground on June 7. They were placed four feet apart each way, and five plants of each variety were used. The soil was a light, sandy loam on which tobacco, which had been well manured, was grown the previous year. The soil was kept cultivated until the growth of the plants prevented it. The vines were not trained in any way, but were allowed to lie on the ground. Owing to the moist season, the crop was not nearly as good as usual.

TOMATOES—TEST OF VARIETIES.

Name of Variety.	Seedsman.	Date of First Ripe Fruit.		Yield of Ripe Fruit. — First two pickings		Yield of Ripe Fruit. — Balance of pickings		Total Yield of Ripe Fruit. — All pickings		Remarks.
				Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
Bond's Early Minnesota.	Gregory...	Aug.	6	22	..	53	4	75	4	Medium size, regular, smooth, purple.
Key's Prolific...........	Vick.....	"	20	1	12	71	12	73	8	Small, scarlet, somewhat pear shaped.
Alpha	Gregory...	"	18	11	6	60	..	71	6	Medium size, wrinkled, scarlet.
Baltimore Prize Taker ..	Landreth..	"	9	13	2	54	14	68	..	Medium size, regular, smooth, purple.
Boston Market..........	Farquehar	"	17	4	11	59	..	63	11	Medium size, regular, smooth, scarlet.
Bright and Early.	Vick......	"	13	23	10	39	..	62	10	Below medium size, regular, smooth, scarlet.
Liberty Bell............	Johnson & Stoke.	"	15	..	..	62	8	62	8	Above medium, regular, smooth, scarlet.
Essex Hybrid...........	Henders'n	"	20	..	15	61	..	61	15	Above medium size, regular, smooth, purple.
Nicholson's Early F'rcing	Farquehar	"	18	..	3	60	8	60	11	Below medium size, slightly wrinkled, scarlet.
Canada Victor..........	Graham...	"	15	7	7	51	8	58	15	Medium size, smooth, scarlet.
Acme	" ...	"	15	7	12	50	..	57	12	Medium size, regular, smooth, purple.
Mayflower..............	Steele.....	"	20	1	2	56	4	57	6	Medium size, regular, smooth, scarlet.
Waldorf................	Thorburn.	"	18	4	8	52	8	57	..	Medium size, regular, smooth, purple.
King Humbert..........	Dreer	"	7	1	10	54	12	56	6	Below medium, irregular, wrinkled, scarlet.
Autocrat.....	Thorburn.	"	20	1	14	54	4	56	2	Medium size, regular, smooth, purple.
Volunteer	Graham...	"	18	..	15	54	15	55	14	Medium size, regular, smooth, scarlet.
Large Red Perfection....	Thorburn.	"	20	1	9	54	4	55	13	Above medium size, regular, smooth, scarlet.
Maule's Earliest	Maule....	"	4	2	11	53	..	55	11	Medium size, regular, slightly wrinkled, scarlet.
Burpee's Combination...	Burpee. ..	"	20	..	10	55	..	55	10	Above medium, regular, smooth, scarlet.
Horsford's Prelude......	Thorburn.	"	15	2	6	52	12	55	2	Small, regular, smooth, scarlet.
Best of All.	Graham...	"	13	6	6	48	4	54	10	Medium size, regular, smooth, scarlet.
Early Bermuda.........	Landreth.	"	14	16	7	37	12	54	3	Medium size, regular, wrinkled, scarlet.
Thorburn's Long Keeper.	Thorburn.	"	20	..	5	53	4	53	9	Below medium, regular, smooth, purple.
Burpee's Climax	Burpee. ..	"	9	11	8	41	8	53	..	Medium size, regular, smooth, purple.
Matchless	Steele.....	"	16	..	..	52	4	52	4	Large, regular, smooth, scarlet.

SIX EARLIEST VARIETIES.

Name of Variety.	Seedsman.	Date of First Ripe Fruit.	Yield of Ripe Fruit. — First two pickings		Yield of Ripe Fruit. — Balance of pickings		Total Yield of Ripe Fruit. — All pickings		Remarks.
			Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
Early Ruby	Steele	Aug. 2	2	14	47	8	50	6	Medium size, regular, smooth, scarlet.
Spark's Earliana	Johnson & Stoke.	July 28	18	14	28	4	47	2	Medium size, slightly wrinkled, scarlet.
Dominion Day	Bruce	Aug. 2	12	12	30	4	43	..	Above medium, wrinkled, scarlet.
Quicksure	Johnson & Stoke.	July 28	15	4	19	8	34	12	Medium size, regular, smooth, scarlet.
Early Leader	Vick	" 28	4	8	26	..	30	8	Medium size, wrinkled, scarlet.
Terrill's Early	Terrill	Aug. 4	7	11	22	12	30	7	Medium size, regular, smooth, scarlet.

SIX BEST YIELDING WRINKLED VARIETIES—AVERAGE FOR FIVE YEARS.

Name of Variety.	Average date of First Ripe Fruit.	Average Yield per Plant.		Remarks.
		Lbs.	Oz.	
Early Bermuda	Aug. 7	16	7	Medium size, regular, wrinkled, scarlet.
Money Maker	" 4	15	4	" "
Extra Early Jersey	" 4	14	5	" "
Early Richmond	" 5	14	1	Medium size, irregular, wrinkled, scarlet.
Democrat	" 5	13	4	Medium size, somewhat wrinkled, regular, purple.
Conqueror	" 2	13	2	Medium size, moderately regular, wrinkled, scarlet.

TWELVE BEST YIELDING SMOOTH VARIETIES—AVERAGE FOR FIVE YEARS.

Canada Victor	Aug. 3	15	1	Medium size, smooth, scarlet.
Baltimore Prize Taker	" 6	14	11	Medium, size, regular, smooth, purple.
Bond's Early Minnesota	July 31	14	9	" "
Brinton's Best	Aug. 12	14	6	Large, regular, smooth, scarlet.
Comrade	" 6	14	6	Medium size, smooth, scarlet.
Early Ruby	July 31	13	15	Medium size, regular, smooth, scarlet.
Mayflower	Aug. 6	13	12	Large, regular, smooth, scarlet.
Extra Early Advance	" 4	13	12	Below medium size, regular, smooth, scarlet.
Horsford's Prelude	" 5	13	12	Small, regular, smooth, scarlet.
Essex Hybrid	" 6	13	11	Above medium size, regular, smooth, purple.
Atlantic Prize	" 4	12	15	Medium size, smooth, regular, scarlet.
Autocrat	....	12	11	Medium size, regular, smooth, purple.

EXPERIMENTS WITH CORN.

Corn is such a popular vegetable that the varieties offered for sale by the seedsmen are being well tested. Last year, a list was published giving the results obtained from seventy-six varieties which were grown. This year seventy-two varieties were tested. In the following table will be found much data regarding the different sorts, there being recorded the name of the seedsman from whom the seed was obtained, the kind of corn, the date when it was fit for use in 1899 and 1900 ; the height in 1900 ; the average length of ears for 1899 and 1900, and the average yield for 1899 and 1900.

The soil in which the corn was grown this year was a light sandy loam on which tobacco, which was manured well, had been grown last year. It was ploughed in the

spring, disc-harrowed and harrowed twice with the smoothing harrow. The corn was planted on May 26, in hills three feet apart each way, the places having been previously marked by a corn-marker. About six kernels were planted in a hill. After germination had taken place and danger from cut-worms was over, the number of plants in a hill was reduced to four. Twelve hills of each variety were used for comparison. The corn was kept thoroughly cultivated during the summer, and when growth had ceased in the autumn it was cut and the ears removed and counted.

Owing to part of the soil being somewhat colder than the other, some varieties which were among the earliest to be fit for use in 1899 were later this year. On this account, the arrangement of early, second early, intermediate, and late sorts in the table was not changed and is the same as in 1899.

EARLY VARIETIES.

Name of Variety.	Seedsman.	Kind.	Fit for use, 1899.	Fit for use, 1900.	Height, 1900.	Length of ears, 1899.	Length of ears, 1900.	Average length of ears for two years.	Marketable ears from 12 hills, 1899.	Marketable ears from 12 hills, 1900.	Average number of marketable ears for two yrs.
					ft. in.	in.	in.	in.			
Extra Early Beverly	Landreth	Hybrid	Aug. 12.	Aug. 9.	6 2	7	6	6½	31	51	41
Extra Early Cory	Steele	Sweet	" 15.	" 11.	5 0	6½	5½	6	60	53	56
Mitchell's Extra Early	Darch and Hunter	Flint	" 15.	" 13.	5 6	8	6½	7¼	59	49	54
Early Marblehead	Steele	Sweet	" 15.	" 12.	6 3	7	6	6½	52	48	50
Telephone Sweet	Salzer	"	" 15.	" 10.	5 6	6	6	6	49	45	47
Early Cory	Bruce	"	" 15.	" 11.	5 11	7	6	6½	42	48	45
Mammoth White Cory	Gregory	"	" 15.	" 10.	5 0	5	5½	5¼	35	32	33
Burbank's Early Maine	J. & Stoke	"	" 16.	" 11.	6 2	6	6½	6¼	59	54	56
Lackey's Early Sweet	Gregory	"	" 17.	" 11.	5 8	7	6	6½	56	48	52
Early Fordhook	Burpee	"	" 17.	" 10.	6 0	6	6	6	52	52	52
Quincy Market	Gregory	"	" 17.	" 12.	6 4	6½	6½	6½	51	46	48
Ford's Early	Ewing	"	" 17.	" 11.	5 10	7	7	7	49	52	50
First of All	Salzer	"	" 17.	" 13.	6 0	6	7	6½	34	39	36
Early Landreth Market	Landreth	"	" 18.	Sept. 6.	8 0	7	8½	7¾	38	55	46
Burpee's Earliest Sheffield	Burpee	Hybrid.	" 19.	Aug. 29.	7 0	6	6	6	57	45	51
Adam's Extra Early	Rennie	Flint	" 19.	" 25.	7 6	7	7	7	42	49	45
Henderson's Metropolitan	Henderson	Sweet	" 19.	Sept. 3.	6 10	7½	7	7¼	48	48	48
White Cory	Thorburn	"	" 21.	Aug. 11.	5 10	7	6	6½	49	45	47
Manhattan Sugar	"	"	....	" 11.	4 6	....	4½	....	....	27	....
Moore's Early	Vick	"	....	....	7 0	....	6	....	....	20	....

SECOND EARLY VARIETIES.

Name of Variety.	Seedsman.	Kind.	Fit for use, 1899.	Fit for use, 1900.	Height, 1900.	Length of ears, 1899.	Length of ears, 1900.	Average length of ears for two years.	Marketable ears from 12 hills, 1899.	Marketable ears from 12 hills, 1900.	Average number of marketable ears for two yrs.
Kendall's Early Giant	Darch and Hunter	Sweet	Aug. 21.	Aug. 22.	6 0	7½	6½	7	43	40	41
Maule's XX Sugar	Maule	"	" 22.	" 22.	6 10	8	6	7	42	39	40
Champion Sweet	Darch and Hunter	"	" 22.	" 29.	6 6	7	6½	6¾	28	35	31
Crosby's Extra Early	Steele	"	" 23.	" 27.	6 6	6	6	6	50	69	59
Early Minnesota	"	"	" 23.	" 22.	6 2	7	7	7	31	47	39
Early Market	Rennie	"	" 24.	" 18.	5 11	7	6	6½	59	40	49
Early Giant Sweet	Steele	"	" 24.	" 20.	6 0	7½	6	6¾	52	37	44
Low's Perfection	Rennie	"	" 25.	" 31.	7 6	7½	8	7¾	59	71	65
Child's Honey Dew	Childs	"	" 25.	" 29.	6 7	7	7	7	54	46	50
Melrose	Thorburn	"	" 25.	" 27.	7 0	7	7	7	46	40	43
Boston Market	Darch and Hunter	"	" 25.	Sept. 8.	7 6	7	6	6½	44	35	39
New Champion	Salzer	"	" 25.	" 6.	7 2	7	8	7½	33	37	35
Pee and Kay	Darch and Hunter	"	" 26.	Aug. 31.	7 2	7½	6	6¾	52	27	39
Shaker's Early	"	"	" 26.	" 27.	8 10	8	9	8½	50	50	50

INTERMEDIATE VARIETIES.

Name of Variety.	Seedsman.	Kind.	Fit for use, 1899.	Fit for use, 1900.	Height, 1900.		Length of ears, 1899.	Length of ears, 1900.	Average length of ears for two years.	Marketable ears from 12 hills, 1899.	Marketable ears from 12 hills, 1900.	Average number of marketable ears for two yrs.
					ft.	in.	in.	in.	in.			
Black Mexican	Ewing	Sweet	Aug. 28.	Sept. 9.	7	1	7	6½	6¾	71	67	69
Burlington Hybrid	J. & Stoke	"	" 28.	" 7.	9	0	8	7½	7¾	53	64	58
Stabler's Early	Henderson	"	" 29.	Aug. 28.	8	0	8	8	8	39	57	48
Nonsuch	Bruce	"	" 30.	....	7	10	8	8	8	30	46	38
Asylum Sweet	Thorburn	"	" 30.	Sept. 8.	8	0	8	8	8	27	51	39
Tuscorora	Rennie	"	" 30.	Aug. 29.	7	0	8½	7½	8	21	47	34
Moore's Early Concord	"	"	" 31.	Sept. 6.	8	6	8	7½	7¾	44	50	47
Perry's Hybrid	Steele	"	" 31.	Aug. 29.	7	10	7½	7½	7½	31	41	36
Russell's Prolific	Vick	"	" 31.	....	8	6	9	8	8½	27	40	33
Amber Cream Sugar	Burpee	"	" 31.	Sept. 8.	7	2	8	8½	8¼	22	53	37
Early Bonanza	J. & Stoke	"	Sept. 1.	" 8.	7	6	7	8	7½	39	49	44
New Early Evergreen	"	"	" 1.	" 8.	7	8	7	7	7	38	29	33
New Honey Sweet	"	"	" 1.	Aug. 31	7	2	7	7½	7¼	33	33	33
Roslyn Hybrid	Thorburn	"	" 1.	Sept. 10.	8	6	8	8	8	38	62	50
Stabler's Nonpareil	Dreer	"	" 1.	" 10.	8	10	8	9	8½	33	40	36
Landreth's Sugar	Landreth	"	" 1.	" 10.	8	1	6½	7	6¾	29	42	35
Early Mammoth Sugar	Bruce	"	" 1.	" 12.	7	10	9	8½	8¾	27	48	37
Hickox Sugar	"	"	" 1.	" 10.	8	2	7	8	7½	26	42	34
Potter's Excelsior	Thorburn	"	" 1.	" 6.	7	2	6	7	6½	18	48	33
Henderson	Henderson	"	" 1.	" 12.	8	6	7	8	7½	14	39	26
Early Eight-rowed Sugar	Thorburn	"	" 2.	" 10.	8	11	8	8½	8¼	39	57	48
Zig Zag Evergreen	Ewing	"	" 2.	" 15.	8	10	7	6½	6¾	35	40	37
Squantum	Henderson	"	" 2.	" 6.	7	2	7½	7	7¼	29	43	36
Triumph Sugar	Thorburn	"	" 2.	" 10.	9	4	8	8½	8¼	23	55	39
New Champion Sugar	Ewing	"	....	Aug. 29.	6	4	....	7	....	....	35	....
Early Champion	Henderson	"	....	" 27.	7	0	....	7	....	....	47	....

LATE VARIETIES.

Name of Variety.	Seedsman.	Kind.	Fit for use, 1899.	Fit for use, 1900.	Height, 1900.		Length of ears, 1899.	Length of ears, 1900.	Average length of ears for two years.	Marketable ears from 12 hills, 1899.	Marketable ears from 12 hills, 1900.	Average number of marketable ears for two yrs.
Columbus Market	Livingston	Sweet	Sept. 4.	Sept. 16.	9	6	10	8	9	36	40	38
Bonanza Sweet	Gregory	"	" 4.	" 10.	7	8	7	8	7½	35	51	43
Shoe Peg	Ewing	"	" 4.	" 18.	8	2	6	7	6½	30	47	38
Extra Early Concord	Landreth	"	" 6.	" 8.	8	2	9	7½	8¼	32	48	40
Red Cob Evergreen	Steele	Dent	" 6.	" 13.	5	5	6	6	6	17	41	29
Egyptian Sweet	Rennie	Sweet	" 7.	" 12.	9	0	8	8	8	31	44	37
Ne Plus Ultra	"	"	" 11.	" 15.	8	0	8	7	7½	24	43	33
Country Gentleman	Henderson	"	" 12.	" 12.	7	9	7	7	7	44	58	51
Stowell's Evergreen	Darch and Hunter	"	" 12.	" 12.	9	1	7	7½	7¼	16	42	29
Mammoth Sweet	"	"	" 12.	" 19.	10	0	6	8	7	14	45	29
Old Colony	Burpee	"	" 14.	" 12.	8	1	6½	7	6¾	24	32	28
Original Stowell's Evergreen	J. & Stoke	"	....	" 10.	9	0	....	8	....	....	46	....

PEASE—EXPERIMENT FOR COMPARISON OF YIELDS AND QUALITY.

For the past three years a large number of varieties of garden pease have been tested in the Horticultural Department. In 1899 there were 157 varieties under test, and notes were taken on their relative earliness, productiveness and quality. The length to which the vines grew was also ascertained. From the 157 varieties that were tested, twenty-seven were noted as being the most promising, quality and yield being two of the most important points taken into consideration when judging their merits. This year it was decided to test these varieties in larger plots. Unfortunately, Heroine and Telephone, two good sorts were omitted in this trial. Cleveland's First

and Best and Alaska, two very early, smooth kinds of not the best quality, were included in the test to compare the earliness of the others with them.

Twelve hundred selected pease of each variety were sown in drills 100 feet long and $2\frac{1}{2}$ feet wide on May 10 and 11. The pease germinated well and a fine stand was obtained. As each variety became ready for use, the date was recorded and the yields of green pods from the several pickings were also kept. The following table shows the results obtained from this experiment.

By referring to the Farmers' List of Best Vegetables on another page, the varieties recommended will be found.

PEASE—TEST OF VARIETIES.

Name of Variety.	Ready for Use.	Number of Pickings.	Total Yield of Green Pods.	Length of Vine.	Quality.
Early.			Quarts.	Inches.	
Gregory's Surprise	June 29	3	20	18 to 22	Very good.
Cleveland's First and Best	July 1	3	26	20 " 22	Medium.
Alaska	" 2	2	24	24 " 28	"
Station	" 3	2	22	18 " 21	Very good.
Premium Gem	" 4	3	36	24 " 28	"
Chelsea	" 4	4	31	12 " 16	"
Nott's Excelsior	" 4	2	23	12 " 15	"
Child's Morning Star	" 4	2	19	30 " 34	"
Exonian	" 4	2	20	24 " 26	Good.
American Wonder	" 5	2	22	15 " 20	Very good.
Second Early.					
Nott's New Perfection	" 9	3	33	22 " 26	Very good.
Gradus	" 9	2	29	28 " 32	"
English Wonder	" 9	3	26	16 " 20	Good.
Medium.					
McLean's Little Gem	" 12	3	36	34 " 40	Very good.
McLean's Advancer	" 14	3	38	30 " 34	"
Burpee's Quantity	" 17	2	47	34 " 38	Good.
Late.					
Dwarf Telephone	" 19	3	40	22 " 26	Very good.
Startler	" 19	2	41	38 " 42	"
McLean's Prolific	" 21	2	62	36 " 40	Good.
Yorkshire Hero	" 21	2	36	30 " 34	Very good.
New Victory	" 22	2	52	38 " 42	Good.
Champion of England	" 23	2	60	60 " 66	Very good.
Boston Wrinkled	" 23	2	54	48 " 52	Good.
Eugenie	" 23	3	50	48 " 54	"
Juno	" 23	2	44	30 " 34	"
Stratagem, Improved	" 24	1	36	28 " 32	Very good.
Veitch's Perfection	" 31	2	38	60 " 66	Good.

TOBACCO.

Fifty-six varieties of tobacco were grown this year, but there was not time to prepare a table for this report showing the results obtained from them. The yields from six good varieties, however, which were grown on larger plots, have been ascertained and the results are herewith given. The land where this tobacco was grown was a good sandy loam, which had been ploughed in the autumn of 1899. In the spring the soil was given a liberal top dressing of rotted barn-yard manure, which was ploughed under, and then the land was disc-harrowed once and harrowed once with

the smoothing-harrow. The seed was sown in the hot beds on April 11, the young plants pricked out into a cold frame on May 22, and planted in the field on June 11, at a distance of 3 x 3½ feet apart. The surface soil was kept cultivated until there was danger of breaking the leaves on the plants. The plants were cut on September 7, being fully matured at that time. They were hung in the tobacco house until dry, and then stripped and the leaves put in hands preparatory to fermenting them.

TOBACCO—TEST OF VARIETIES.

Name of Variety.	Number of Plants.	Weight of 1st Grade.	Weight of 2nd Grade.	Weight of 3rd Grade.	Total Yield per Acre. All Grades.	Condition when Cut.
		Lbs.	Lbs.	Lbs.	Lbs.	
White Burley.......... ..	511	67½	51¾	39¼	1,286	Ripe.
Improved White Burley....	470	59	69¾	20	1,313	"
Zimmers' Spanish..........	483	33½	59½	33¼	1,086	"
Pryor Blue................	385	45	64	28½	1,482	"
Small Havana..............	495	49½	65	15	1,085	"
Little Oronoka........ . .	474	43	62	15½	1,055	"

ARBORETUM AND BOTANIC GARDEN.

The Arboretum and Botanic Garden continues to increase in usefulness and improve in appearance every year. The collection of trees, shrubs and herbaceous perennials is now very large and in many genera few additional species and varieties can be procured. The list of trees and shrubs being tested here, which was published last year, has given much satisfaction and there are many requests for it. It was reported in that list that up to the time of its publication 3,071 species and varieties of trees and shrubs had been tested, of which 1,465 were hardy, 330 half hardy, 229 tender, 307 winter-killed and 740 had not been tested long enough to admit of an opinion being given as to their hardiness. Since the list was published, still further additions have been made. The collection of perennials has also been much increased during the past few years, and it is hoped that in the near future a list will be published of them also.

This year was a favourable one for the trees, shrubs and plants. Though the tenderer things were injured by winter, as usual, it was not exceptionally severe, and the summer being moist nearly everything made good growth. While the grounds were kept in fairly good order during the season, more help is necessary to keep everything in good condition.

In the limited space which may be devoted to the Arboretum and Botanic Garden in the annual report, it is not possible to describe many of the plants which are being grown there, but each year the object has been to present descriptive lists of the very best things. In the report for 1897 a list was published of one hundred of the best ornamental trees and shrubs, and also one hundred of the best herbaceous perennials. In 1898 a supplementary list of good perennials was given, and in 1899 a descriptive list of twenty-five of the best low-growing flowering shrubs and an additional list of good perennials. This year it was thought that a list of the best climbing plants would prove acceptable.

SOME GOOD WOODY CLIMBERS.

There are many homes which could be made much more attractive looking by the judicious use of a few good vines. A house which lacks any pretence of beauty in architecture may have much of the stiffness taken from it by planting a vine where it will break the monotony of a straight wall. Verandahs, summer houses, fences, rocks and old stumps of trees covered with vines will so change the appearance of a place that it will hardly be recognized by one who has known it before. There are so many good hardy native climbers that it is not necessary to go to any expense in procuring something which will produce the desired effect. In the following list some of the best of those described are natives. Climbers usually make rapid growth when once established. The best results will be obtained, however, by preparing the ground well beforehand. Usually the soil about buildings is poor, and if such be the case it will well repay any one to remove it where the vines are to be planted and replace it with some of a good loamy character, thoroughly mixing well rotted manure with it. If such preparation is given the results will almost certainly be satisfactory.

Aristolochia Sipho—Dutchman's Pipe.—Although the Dutchman's Pipe is not as hardy as some vines, it is grown with fair success here. Before beginning to make rapid growth, however, it requires two or three years to become established. The leaves are large, heart-shaped and deep green. This vine, though quite attractive, has a heavier look than some others, and is more in keeping with a massive building than with one of a lighter style. It twines about whatever object comes within reach and does well on a trellis or verandah. The flowers, which are partially hidden by the large leaves, are brown and of peculiar shape, much resembling a Dutchman's pipe. It is a native of the eastern United States, and grows from 20 to 30 feet high.

Celastrus articulatus—Japanese Climbing Bitter-sweet.—This is just as attractive, if not more so, as the native species. The berries are smaller, but more abundant, and there is a greater contrast in colour between the outside and inside of the fruit than there is in *Celastrus scandens*, the colour in this case being yellow and orange. It is a native of Japan, a rapid grower and a very desirable vine.

Celastrus scandens.—Climbing Bitter-sweet, Wax-work.—Next to the Virginian Creepers and Virgin's Bower, this is probably the best native climber that we have. It is a very rapid grower, with pretty bright green leaves, and highly ornamental fruit. It is very suitable for training over summer houses and verandahs, and twines about everything it can get hold of. In procuring this vine, one should be certain that he is getting one which produces both male and female flowers, as some vines have only male blossoms, and in such cases no fruit is produced and much of the beauty of the vine is lost, as the fruit is quite attractive and hangs on most of the winter. The berries are of an orange colour until they are cracked open by frost, when the interior, which is scarlet, is revealed.

Clematis Jackmanni.—The large flowered Clematis are well represented by this superb variety, which is one of the best of them. The flowers are very large and rich, violet purple in colour, with a velvety appearance. It is a very free bloomer and remains in flower for several weeks. Where a strong colour effect is desired this is a good plant to use. There are now many varieties of large flowering Clematis, and a good range of colour can easily be obtained.

Clematis ligusticifolia—Western Virgin's Bower.—This species is a native of the North-west Territories and British Columbia, and while it may not prove as satisfactory in the east as *C. virginiana*, it should prove very valuable when cultivated in those parts of Canada where it is native. The leaves are smooth and glossy, and are

more attractive than the ordinary Virgin's Bower. The flowers are numerous, small and white, and the vine looks very beautiful in midsummer, when it is in full bloom.

Clematis paniculata—Japanese Clematis.—No climber introduced in recent years has proved as satisfactory and as beautiful as this one. It is not as hardy as *C. virginiana,* but it is much finer when in bloom. The flowers are larger than *C. virginiana, C. ligusticifolia* or *C. Vitalba,* and are much whiter. This attractive vine does not bloom until autumn, and is at its best during the month of September, when other kinds have gone to seed, at which time it is a perfect mass of attractive white, sweet-scented flowers. It kills back considerably every winter, but the growth is so rapid in the spring that this is not a great disadvantage, unless one desires to have a large surface covered, when *C. virginiana* is better.

Clematis virginiana—Virgin's Bower.—Next to the Virginian Creepers, this is the most satisfactory native climber to plant, and the most satisfactory where the former are troubled with thrips. It is a very rapid grower, and soon covers anything it is planted near. It clings by tendrils, and should have something to which these can fasten. The leaves are of a lively green colour and of graceful form. About midsummer the small greenish white male flowers come into bloom, and these are produced in such abundance that the vine is fairly covered with them. The female flowers are also attractive.

Clematis Vitalba—Traveller's Joy.—A European Clematis which very much resembles *C. virginiana.* It is a rapid grower and quite hardy. Where it is more convenient to get this species than the native one it may be planted with the certainty that it will give good satisfaction.

Lonicera hirsuta—Hairy Honeysuckle.—The honeysuckles make good climbers, and this native species should be particularly valuable in the colder parts of the country, and as it grows naturally as far west as Lake Superior, it will probably prove hardy anywhere in Ontario or the Province of Quebec. It is a profuse bloomer, being covered with rich yellow flowers during part of June. Unfortunately, it does not, like *L. sempervirens* and *L. Periclymenum,* continue blooming during the summer. It is very attractive when the vine is kept compact, as the flowers are then more massed together, and show off to better advantage.

Lonicera Periclymenum—English Honeysuckle, Woodbine.—Though not quite as hardy as the next species, this honeysuckle will succeed very well if it is not too much exposed. It blooms about the middle of June, and the flowers are bright pink outside and yellow within, and have an agreeable spicy odour, which makes it a desirable vine for planting by or near the house.

Lonicera sempervirens—Scarlet Trumpet Honeysuckle.—A very attractive climbing honeysuckle, blooming almost continuously from the first week of June until late in autumn. The profusion of bright, scarlet, trumpet-shaped flowers produce a fine effect when it is trained against a house or wall. It is a native of the Eastern States, and is quite hardy at Ottawa.

Lycium chinense—Chinese Matrimony Vine.—This is a graceful climbing shrub which is very useful for covering rocks, stumps of trees, or anything else where a tall growing vine is not required. Neither the leaves nor flowers are particularly ornamental, but the graceful habit of the plant commends it, together with the fact that in the autumn the bright scarlet fruit gives it a very attractive appearance. There is a variety, *macrocarpum,* which is an improvement on the ordinary form, in that the fruit is larger, and hence more conspicuous. The ordinary Matrimony Vine, *L. europaeum,* is a desirable climber also, but it is not so good as *L. chinense,* as the fruit is much smaller.

Vitis inconstans (*Ampelopsis Veitchii*)—Japanese Ivy.—The Japanese Ivy is not thoroughly satisfactory in Ontario and Quebec, as it kills back more or less every year, and sometimes is killed out altogether. In the warmer parts of these provinces, however, it may be grown with fair success. It is a beautiful vine and clings so tightly to the wall on which it is trained that it is unsurpassed in this regard. The leaves also are of an attractive green colour in summer, and at times are highly coloured in autumn. When grown, a north or west side of a building is the best site. Many make the mistake of putting it on the south side. While this cannot always be avoided, a place where it is not much exposed to the sun is better. It appears to be the thawing and freezing of the vine in early spring which often has such an injurious effect upon it. This injury is not as great on a north or west exposure. For the first year or two this vine should be protected in winter until it gets well established. Something which will not readily absorb the heat should be chosen for this purpose. Straw is a very good material to use, if held in place by something else.

Vitis quinquefolia (*Ampelopsis quinquefolia*)—Virginian Creeper.—This fine climber has several points of merit which commend it to those who desire a hardy, graceful, attractive vine. It is a rapid grower, and being a native of Ontario and Quebec, is perfectly hardy. Its glossy, green leaves become very brilliant in autumn, when they assume many shades of red. Although it has tendrils by which it clings if there are crevices into which they can be inserted, it will not cling to a wall where there are not such places, and has to be supported in some other way. It is very desirable for training over summer houses, fences, verandahs, and even on walls, where it falls in graceful festoons and becomes very attractive. Unfortunately, it is much subject to thrip, and while there is a remedy in whale oil soap, tobacco water, and kerosene emulsion, they have to be applied very persistently. Where there is a good circulation of air or where the vines are often moved by the wind, the thrip is not so troublesome.

Vitis quinquefolia hirsuta—Self-fastening Virginian Creeper.—The advantages of this vine over the ordinary Virginian Creeper are so great, in certain respects, that it should be grown in preference to the latter if a vine is desired for covering a wall. This variety has smaller leaves than the ordinary species, and while those of the latter are quite smooth and shiny, those of the former are downy on both sides. The tendrils of *hirsuta* are short and furnished with large discs, by means of which this vine clings to a brick or stone wall almost as tenaciously as the Japanese Ivy. It is much neater looking than the ordinary form, and needs practically no attention as regards training. The leaves colour about as highly at Ottawa as the common Virginian Creeper. This variety may be found growing wild in the woods in the vicinity of Ottawa, and has also been noticed in the Eastern Townships of Quebec.

Vitis riparia—Riverside or Sweet-scented Grape.—The grape vine makes a highly ornamental climber, as it is a rapid grower and very graceful. This native species has the great advantage of being perfectly hardy and of having very highly perfumed blossoms. The male and female flowers of this species are borne on different vines, and if the delicious perfume is to be had one with male flowers must be planted. One drawback to the wild grape being used as a climber near the house is that it is subject to the attacks of thrips, which disfigure the leaves very much. In exposed places, however, where there is a good circulation of air, they will not be so troublesome.

The Wistarias and Actinidias are also good climbing shrubs where they can be grown successfully. The former have bloomed at Ottawa, but they are not very satisfactory, except in the mildest parts of the province of Ontario.

ANNUAL CLIMBERS.

In addition to the shrubby and perennial climbers in the foregoing list, there are some fine annuals which may be used with good effect, of which the sweet pea and nasturtium furnish an abundant supply of lovely flowers for cutting for many weeks

during the summer. The following are those which will be likely to give the greatest satisfaction:—

Sweet Pea.—The sweet pea is one of our most popular flowers, and justly so. For variety of colour, delightful perfume and continuity of bloom it is difficult to surpass. Unfortunately, there are many who do not grow this beautiful flower who might if they would. The chief requisites to successful sweet pea culture are early planting, plenty of moisture and good drainage. These are all nearly equally important. Sweet pease should be planted as soon as the ground is dry enough in the spring, as this will give the plants a chance to root properly before warm weather sets in, and also give the roots an opportunity of getting down into the moist, cool soil. A week or two of delay in planting will result, as a rule, in much poorer flowers. A site should be chosen where the vines will get full sunlight most of the day. This is important. Well rotted manure should be dug in and well mixed with the soil the previous autumn. This will usually give better results than manuring the soil in the spring, as there is danger of making the ground too loose and dry. A trench should be made about five or six inches wide and four inches deep. The pease should then be sown rather thinly along the bottom of it. An ounce of seed to a row thirty feet long is considered a fair amount. The seed should now be covered with about two inches of fine soil. If much more is put on, the plants will not come up as readily. After they are about six inches high the trench may be filled level with the soil, the object being to get the roots well down, but if there is danger of the ground drying out, the trench and each side of it may be covered with hay, straw or leaves, which will act as a mulch and help to keep the soil cool and moist, and the rain will be caught in it. The brush or trellis should now be put down. If this is delayed the vines will be injured when attempting to train them.

The surface soil should be kept loose with a hoe during the summer, as this will encourage growth and help to retain the moisture in the ground. It is well worth the trouble to water sweet pease if the soil is not naturally moist, as the flowers will be larger and there will be more of them. Sweet pease should begin to flower during the first week in July, and there should be a continuous succession of bloom until severe frost in the autumn. To keep them blooming, however, it is very necessary to prevent the flowers from going to seed and to keep the soil moist. If all the flowers are not desired or cannot be disposed of, those not wanted should be nipped off.

There are a great many varieties of sweet pease offered for sale, and it is puzzling to many to know which to choose. Most people, however, buy mixed seed, not knowing what varieties they are getting. These are not as satisfactory as named varieties. The following eighteen sorts, which give a good variety of colour, are recommended as being among the best:—

Blanche Burpee, Countess of Powis, Lottie Hutchins, Lady Mary Currie, Prima Donna, Prince of Wales, Improved Salopian, Lady Grisel Hamilton, Navy Blue, Triumph, Edward of York, Stanley, Golden Gleam, Coquette, Aurora, Ramona, Maid of Honour, Mrs. J. Chamberlain.

Nasturtium.—Next to Sweet Pease, Nasturtiums are the most satisfactory annual climbers that furnish flowers for cutting. Like Sweet Pease, a continuous succession of brilliantly coloured flowers may be kept up from early summer until late autumn. The soil in which Nasturtiums are planted should not be very rich or the plants will run to vine rather than flowers, and this is not desirable. A site should be chosen where the vines will be exposed to full sunlight most of the day, as Nasturtiums bloom better so situated. The seeds should not be sown as early as Sweet Pease, as they are liable to rot when the ground is cold. It should be planned to have the young plants coming up about the third week of May. If they appear earlier, there is danger of their being injured by frost. The soil should be well prepared by digging and raking, and the seed sown about 2 inches apart and from 1 to 2 inches deep. After the young plants are well established, they should be thinned to from 5 to 6 inches

apart. The surface soil should be kept loose during the summer to encourage the growth of the vines and retain moisture in the soil. Nasturtiums need more care in training than Sweet Pease, as they have no tendrils to cling with.

Nasturtiums are very effective, as the leaves are bright green and the flowers of such lively shades of yellow, brown and crimson that the contrasts are very fine. If planted where they may be trained over any objects about the grounds suitable for the purpose, they make a very pleasing effect.

There are two strains of climbing nasturtiums which are much grown, the first known as Lobbianum, and the second as Tall Nasturtiums. The former have smaller flowers, but are more profuse bloomers than the latter; but both are good. Some fine colours may be obtained by planting the hybrids of Madame Gunter. Good mixed seeds will be found quite satisfactory.

Variegated Japanese Hop.—The so-called Japanese hop is an annual, and this is a variety of it. It is one of the most rapid-growing vines that can be planted. Part of the leaf is almost pure white and part gray, making the contrast with the remaining green portions very effective. The seed should be sown early in the spring and the plants thinned out well after they are large enough for the variegations of the leaf to be distinguished. Some plants are more variegated than others and have the white parts of the leaf whiter, and these should be left. The seed should be pinched off when they form, as they rather spoil the otherwise fine effect of the vine.

Scarlet Runner.—Though old-fashioned, the scarlet runner is still one of the most attractive of annual climbers. It is such a free bloomer that the effect produced by the scarlet flowers is very good. The seed should be sown when there will be no danger of frost after the young plants appear above ground.

Morning Glory.—This is another old-fashioned flower, but one which deserves a place, where there is room for it. The seed should be sown early in spring, if the best results are to be obtained. The Imperial Japanese Morning Glories, which were introduced a few years ago, are larger than the ordinary kind and more brilliantly coloured.

Cobaea scandens.—Although this vine is a perennial, it can only be treated as an annual when grown outside, as it winter-kills. To get good results, the Cobæa should be started in a cold frame and planted out in the open towards the end of May or about June 1, it being very tender. It makes a rapid and luxuriant growth during the summer and comes into bloom towards the latter part of the season. The flowers are about 2 inches in diameter and are greenish white or purple, according to the variety planted. The purple flowering variety is the best, as the vine has purple stems, making the contrast with the leaves better. The flowers, also, are prettier than the white ones. Unfortunately, the season of this vine is not long, as it is killed by the first frosts of autumn.

Madeira Vine.—This is another old favourite which must be treated as an annual. The root should be planted in the spring, after danger of frost is past. The growth of this pretty climber is very rapid, and it will cover a large surface during the summer. Its thick, bright green leaves are the chief attractions of the plant. In the autumn, the roots should be taken up and stored for the winter.

Canary Bird Vine—Tropaeolum canariense.—This is a very pretty climber which bears an abundance of small bright-yellow flowers, which fancy may compare to a bird with wings half extended. It is a rapid grower and soon runs over the trellis, lattice-work, or other object which is placed for its support. The seeds should be sown early.

There are a large number of other annual climbers, but those just described are among the best. Among these are the gourds, which are quite attractive. When trained over fences, the varied shape and colour of the gourds, which are produced in abundance, give an odd appearance to the vine.

Central Experimental Farm, Ottawa. Nitrogen and Water Analysis Laboratory.

Central Experimental Farm, Ottawa. Main Chemical Laboratory.

REPORT OF THE CHEMIST.

(Frank T. Shutt, M.A., F.I.C., F.C.S., F.R.S.C.)

Ottawa, December 1, 1900.

Dr. Wm. Saunders,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the fourteenth annual report of the Chemical Division of the Experimental Farms.

The work of the past year has been of an exceedingly varied character, investigations relating to many special branches of agriculture and the solution of problems affecting farming in different parts of the Dominion, being undertaken. In addition to this class of work, direct assistance has been given by the analysis of typical representative samples sent in by farmers. Time, however, has not allowed us to satisfy all the demands made in this connection, for we recognize that original research must have the first claim upon our attention.

In the following paragraphs a brief account of the matters above referred to is given.

Soils.—Samples representative of a large area in the vicinity of New Westminster, B.C., occupied by a number of fruit-growers and market gardeners have been submitted to analysis. The results are accompanied by suggestions regarding the best means to supply the soil's deficiencies.

Soils from the Experimental Station of the North-west Territories, at Calgary, Alta., collected from virgin and cultivated areas, as well as from irrigated and non-irrigated lands, have been carefully examined, and several interesting features revealed in connection with the effect of irrigation.

A cultivated sandy loam from the neighbourhood of Annapolis, N.S., has also been analysed and reported on.

Many samples of soil have been sent in by farmers, but since they only received a partial analysis no account of them has been recorded in the report.

Valuable results in the conservation of soil moisture by summer fallowing, obtained from an investigation carried on from May to November with samples collected monthly on the Experimental Farms at Brandon, Man., and Indian Head, N.W.T., are recorded. The exceptional character of the season this year in the North-west afforded specially favourable conditions for the prosecution of this research, and as a result we are able to publish data of a most instructive order.

We have also been able to trace the course of nitrification throughout the summer in these North-west soils, though there are doubts, owing to the great drought in the early part of the season, as to whether the results obtained should be considered as normal.

Fertilizers.—Information as to the agricultural value of marl, woollen waste, wood ashes, from samples examined in the laboratories is given.

Foods and Feeding Stuffs.—Under this caption many interesting chapters will be found. Rape as a forage plant is being widely introduced. The prominence that this crop has received recently made it desirable to ascertain its feeding value at different stages of growth. This has accordingly been done and is now reported on.

The relative feeding value of certain varieties of mangels, carrots, turnips and sugar beets has been determined and tabulated.

Various milling by-products, such as bran, cotton-seed meal, cocoa-nut meal, corn meal, &c., have been submitted to analysis and accounts regarding them are to be found in the present report.

Certain comparatively new and important legumes have been examined as to their feeding value. Several of these, as far as is known, have not previously been analysed, and consequently the information gained will be of peculiar interest.

A number of samples of sugar beets have been tested as to their sugar content and purity. These were received from the Manitoba Government, Winnipeg, from the Experimental Farms at Brandon and Indian Head, from the North-west Irrigation Company, Lethbridge, Alta., and from Prince Edward Island. The data are accompanied by conclusions as to the value of the beets for sugar making purposes.

Wheats.—A comparative study of the well-known Red Fife wheat with certain cross-bred wheats has been made. These latter, originated by Dr. Saunders, are the Percy, Stanley and Preston, and were obtained by crossing the Red Fife with earlier ripening sorts, chiefly from Northern Russia. The close relationship of these wheats with the parent Red Fife is obvious from an examination of the data.

A rumour being prevalent that wheat of the crop of 1899 contained an excessive amount of moisture, thus impairing its keeping qualities, a number of moisture determinations were made, the samples being furnished by Mr. D. Horn, Chief Grain Inspector, Winnipeg. The results show that the moisture was not excessive or abnormal.

Insecticides and Fungicides.—Various compounds, such as Arborine, Harvesta, Canadian brands of whale oil soap, &c., have been examined and their general composition, with remarks as to their probable effectiveness, given.

Well Waters from Farm Homesteads.—This useful work has been continued and the results of those samples submitted to complete analysis during the past year are appended in tabular form, together with deductions as to their relative purity.

Correspondence.—From December 1, 1899, to November 30, 1900, 1,126 letters were received, and 1,453 despatched.

Tuberculin.—The tuberculin supplied to the Dominion Veterinary Surgeons has been prepared and forwarded, as formerly, from the Farm laboratories. During the twelve months ending November 30, 1900, 20,903 doses, as against 17,179 doses in the year previous, have been sent out.

Soft Pork Investigation.—As may be well known, we have been engaged during the past eighteen months on a research, the object of which was to ascertain the cause or causes of 'softness' in pork. A preliminary report, giving many of the results obtained to date, appeared in our last year's report. The analyses in connection with the first feeding trials were completed last June, the carcasses of 187 pigs having been examined and chemical and physical data of the fatty tissue, taken from the shoulder and from the loin, obtained. Many of the results were of such a striking character that it was thought desirable to make a second feeding trial which would include most of the important rations of the first trial, in addition to others of a slightly modified character. This second series of experiments was commenced in the early months of the present summer, 102 pigs being placed in pens of 6 each, under the varying conditions of the trial. Of these animals, in the neighbourhood of 60 have to date been slaughtered and analysed. The data so far are strongly corroborative of those obtained in the first series, and there can be no doubt but that we shall be in possession at the close of this experiment (which will be in about two months' time) of very satisfactory and reliable information regarding the effect of various food stuffs on the quality of pork.

The amount of laboratory work in connection with this research has been enormous, but the growing importance of the English export bacon trade—both to farmers and pork packers—may be urged as a justification for the exceedingly large though necessary expenditure of time. Already the investigation has yielded important and valuable results (see pages 151 to 155 Report for 1899), and there is every probability that still more valuable deductions may be drawn from the data at the close of the present experiments. It is proposed to publish these conclusions in bulletin form, as soon as the laboratory work is finished, which, as we have said, will be in about two months' time.

Samples Received for Analysis.—In the following schedule we furnish the number and indicate the character of the samples received during the past year for examination and report:—

SAMPLES Received from Farmers for Examination and Report, November 30, 1899, to December 1, 1900.

Samples.	British Columbia.	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	12	38	39	8	7	2	8	1	115	33
Mucks, muds and marls	....	....	....	8	1	3	4	8	24	9
Manures and fertilizers	....	....	....	3	4	....	2	3	12	5
Forage plants and fodders	....	13	37	29	3	2	2	1	87	11
Well waters	3	7	11	34	8	8	4	....	75	......
Miscellaneous, including dairy products, fungicides and insecticides	1	2	8	6	8	2	5	3	35	13
Total	16	60	95	78	31	17	25	16	348	70

Acknowledgments.—Naturally, with the ever increasing work of the Division, more and more of that which is purely analytical falls to the lot of the assistant chemists. The past year, as evidenced by this report, not to speak of the very large number of analyses that have been made in connection with the soft pork investigations, has been an exceedingly busy one, and I am consequently more than ever indebted to my assistants for their valuable aid.

Mr. A. T. Charron, B.A., First Assistant Chemist, has continued to discharge his duties with fidelity and skill. From the date of his appointment, Mr. Charron has taken a keen and intelligent interest in agricultural research and investigations, and has afforded me most valuable help in the work of this Division.

To Mr. H. W. Charlton, B.A.Sc., Second Assistant Chemist, my thanks are also due. He has been most assiduous in his work, all of which has been characterized by care and thoughtfulness, and I am pleased to bear testimony to his good services.

The clerical labours involved in carrying on the various parts of our work is now very considerable. It includes stenographic and typographic and secretary work in general, in addition to the calculation and posting of analytical results. In all of this we have had the help of Mr. J. F. Watson, who, as in former years, has earned my thanks for a careful and painstaking performance of his duties.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
Chemist, Dominion Experimental Farms.

CANADIAN SOILS.

BRITISH COLUMBIA.

New Westminster.—A sample of the surface soil, together with its underlying subsoil or hard-pan, representing the character of the soil on the peninsula formed by the Fraser river and Burrard inlet, have been submitted to careful and complete analysis. The examination was undertaken with a view of rendering assistance to the fruit-growers, market-gardeners and farmers in the neighbourhood of New Westminster, who had found considerable difficulty in profitably working this soil. The collection of the soils was made by Mr. W. J. Brandrith, Secretary B. C. Fruit-growers' Association, New Westminster, who, speaking of the samples, under date of February 20, 1900, says :

'No. 1 is a virgin soil ; it has never been disturbed by the hand of man, but thirty years ago a very destructive fire swept over the whole district. The timber had been chiefly cedar ; a second growth of red fir, poplar and willow is now growing. The depth of soil to the hard-pan varies from 6 inches to 5 feet, and averages about 2 feet 6 inches. The soils were taken from lot 25, group I., N. W. district, municipality of Burnaby, and distant about 27 chains from the northern boundary of New Westminster. It is a very fair sample of the soil of the whole peninsula formed by the Fraser river and Burrard inlet.

'No. 2 is from the hard-pan underlying No. 1. It has been exposed to the air, but not to the rain, since September 26, 1899.

'No. 3 is from the hard-pan, taken from a depth of 2 feet in the hard-pan, or 5 feet from the surface of the soil.'

Analysis and Report—No. 1.—The soil has all the appearance of a light, sandy loam. It contains a considerable amount of gravel and small pebbles, as well as of undecomposed root fibre. Tested with litmus paper, it gives a strong acid reaction. After preparation, the fine earth (which in the air-dried condition is of a grayish-red colour) was submitted to analysis.

Nos. 2 and 3 are light gray in colour. They consist of firmly-cemented masses, chiefly of sand, with pebbles intermixed. To the eye there is no indication in either of them of humus, and they have the appearance of being exceedingly poor and refractory.

ANALYSIS of Soils (water-free), Municipality of Burnaby, B.C., 1900.

Number.	Soil.	Organic and Volatile Matter	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Phosphoric Acid.	Soluble Silica.	Carbonic Acid, &c., (undetermined).	Total.	Nitrogen.	Available.		
													Potash.	Phos. Acid.	Lime.
1	Surface............	9·00	77·98	11·65	0·35	1·26	0·12	0·13	0·12	......	100·61	·148	·0088	·0049	·0039
2	Hardpan, 2 feet from surface..........	4·07	82·14	11·56	0·70	1·18	0·15	0·13	0·09	......	100·02	·041	·0062	·0173	·0490
3	Hardpan, 5 feet from surface..........	3·60	82·75	11·22	0·36	0·65	0·16	0·13	0·08	1·05	100·00	·028	......	......	......

No. 1.—Surface soil. The chief constituents to consider are potash, phosphoric acid, and nitrogen and lime Our previous work on Canadian soils would show that good examples from uncultivated areas will, as a rule, contain from ·25 to ·50 per cent potash, from ·15 per cent to ·25 per cent phosphoric acid, from ·15 per cent to ·2 per cent nitrogen, and from ·5 per cent upwards of lime. Many of our richest

soils have given numbers far larger, but these may fairly represent the limits exhibited by soils of good, medium quality. The amounts of potash, phosphoric acid and lime designated in the table as available are those obtained by digesting the soil with a one per cent solution of citric acid in the cold. English results seem to justify the assumption that less than ·01 per cent of phosphoric acid, so obtained, indicates the soil's need of phosphatic manure. With regard to the available potash, Dr. Dyer, who showed that the acidity of root sap was approximately equal to the afore-mentioned solvent, says that when such potash falls below ·005 per cent, potash fertilizers would prove valuable. Judged by these standards, we are obliged to confess this soil as considerably below the average in all its important elements, save perhaps in available potash.

Humus and Nitrogen.—It is extremely doubtful if commercial fertilizers could be used profitably on this soil unless supplemented, or rather preceded, by organic manures. When the store of humus has been increased, the soil will be more retentive of and responsive to such plant-food as may be supplied in chemical fertilizers, and further it will be warmer and furnish a more comfortable medium for seed germination and root extension. Barnyard manure, naturally, stands first in importance as a source of soil humus; it would be difficult to overestimate the value of this manure for soils such as we are discussing. Not only for its organic matter, is it to be recommended; as a supplier of nitrogen and a considerable amount of mineral matter in a more or less available condition, it has a distinct value.

Unfortunately, in the majority of cases, especially where there is a considerable area tilled, there is not a sufficiency of manure, and it then becomes of the highest importance to know what can be most economically used as a substitute. Where swamp muck occurs, this material may be utilized, first being piled and allowed to dry out and then fermented as in the compost heap, either with manure or with lime or wood ashes. The air-dried muck may be employed as an absorbent in the cow stable, pig-pen, &c., to absorb the liquid manure. In this way a double purpose is served—the valuable liquid portion of the manure, which might otherwise be lost, is retained, and the fertilizing elements in the muck set free. Good samples of air-dried muck will contain from 65 per cent to 85 per cent organic matter, and from 1·25 to 2·5 nitrogen.

Possibly the only feasible plan of furnishing humus and nitrogen over large areas is by the turning under of a growing crop of clover or some other legume. This is termed green manuring, and is certainly to be regarded as the most economical and one of the quickest methods of replenishing the soil's humus. The benefits to be derived from green manuring, especially when a legume is used, have so repeatedly been set forth in our past reports that it may not be necessary to speak at any length on that subject. It is well to emphasize, however, in this connection, three points: first, if the soil is too poor to grow clover, buckwheat or rye, may be ploughed under for a year or two and the land thus made suitable for clover; secondly, that a dressing of wood ashes or a fertilizer containing potash and phosphoric acid will very much help the clover, and, thirdly, there will be no practical enrichment of the soil with nitrogen, unless a legume is used, since the legumes only have the ability (by the means of certain germs that reside in nodules on their roots) to appropriate and store up the free nitrogen of the air.

Lime.—The analytical data show that this soil is by no means rich in lime, and its well marked acidity accentuates this fact. The land evidently stands in need of lime, not only as a source of plant food, but to correct that sourness which is injurious to most farm crops. Since it is not wise to make heavy applications of lime, and since this element has the tendency to work or wash down into the subsoil out of the reach of the roots, the application of, say, 20 bushels per acre every second or third year, will prove better practice than a larger dressing at greater intervals. If phosphoric acid is applied in the form of Basic slag, much less lime than that indi-

cated will be necessary, since that fertilizer contains a considerable proportion (usually 12 per cent to 15 per cent) of free lime.

Shallow culture, i.e. shallow ploughing with an occasional loosening, but not bringing to the surface, of the subsoil is to be advised for this and similar soils. It seems desirable owing to its light and hungry character to keep the humus, lime and other fertilizers as far as possible in the first 4 or 5 inches of soil. A deep tilth is undoubtedly a feature of great value, but it can scarcely be economically produced and retained in very light and sandy soils. For further details as to the economical improvement of poor and exhausted soils, the reader is referred to the report of this Division for 1899, page 133, et seq.

Commercial Fertilizers.—In the question of commercial fertilizers it will only be possible to indicate the general principles to be followed, since the nature of the crop to be grown and the past history of the field must necessarily be taken into consideration before definite formula for any specific purpose can be suggested. The following remarks, however, may be useful :—

Nitrogen.—Of the commercial forms of organic nitrogen in British Columbia, fish-waste prepared from the offal of the canning factories, sometimes known as fish-meal or fish-pomace, holds a high place. Its composition will vary according to the parts of the fish that predominate in its preparation ; thus, some samples may contain between 2 and 3 per cent of nitrogen, and 10 to 15 per cent of phosphoric acid, while others possess 5 to 7 per cent of nitrogen and 2 to 3 per cent phosphoric acid. This fertilizer, it is obvious, may be used to supply two of the three elements generally necessary, but should be supplanted by a potash manure—such as Kainit, muriate of potash, or wood ashes.

We may regard it as a concentrated and quick acting manure, best used as a top dressing or applied to the ploughed land and lightly harrowed in before seeding. It has been applied with success to grain crops and grass lands especially, and gives the greatest returns on light, warm, well-drained loams. For an ordinary dressing, a mixture of 500 pounds of fish-meal and 100 pounds of muriate of potash per acre is suggested.

Nitrate of soda and sulphate of ammonia furnish large amounts of readily assimilable nitrogen. Undoubtedly the former, considering the character of the soil, will be the better; for acid soils and soils deficient in lime sulphate of ammonia may do positive harm. From 100 pounds to 200 pounds per acre may be applied in several applications (at intervals of a few weeks) as a top dressing during the earlier months of growth. The great solubility of nitrate, points to the advisability of never applying it save when there are growing plants to make use of it, and the economy of several small dressings, rather than one large one at the opening of the season.

Phosphoric Acid.—Bone meal, superphosphate and basic (Thomas) slag are the chief phosphatic fertilizers obtainable, leaving out of consideration fish pomace, already referred to. Bone meal is a source of nitrogen also, containing from 2·5 to 4·0 per cent of this element. Its phosphoric acid is not immediately assimilable, but becomes so gradually in a soil that is warm, moist, and well drained. It is probably better suited for grass lands and orchards than for crops with a short season of growth. The usual application lies between 300 and 500 pounds per acre.

Owing to the sourness of the soil of this tract and its deficiency in lime, the writer is of the opinion that basic slag, finely ground, would be found a very useful source of phosphoric acid. It contains in the neighbourhood of 17 per cent phosphoric acid, and 15 per cent free lime. Its application may be from 300 to 500 pounds per acre. Such excellent results have been obtained from this fertilizer in Germany and England, that it would appear to be well worth trial, especially on soils similar to those we are now considering. Further information regarding basic slag will be found in the report of this division for 1898.

Potash.—Unfortunately, it appears that wood ashes—a most valuable source of this element—are not purchasable in British Columbia.

To those in proximity to the coast, sea-weed will prove a cheap and valuable manure, since it contains considerable amounts of potash and nitrogen. Unless well dried, it would scarcely pay to freight sea-weed any distance inland, and in any case it is advisable to allow the sea-weed to lose a portion of its water before hauling to the farm.

Kainit, muriate of potash and sulphate of potash are potassic manures imported from Germany. Kainit contains about 12 per cent actual potash ; muriate and sulphate about 50 per cent actual potash. These fertilizers should always be bought on guaranteed analysis.

The average application of the muriate and sulphate is 100 pounds per acre ; of the kainit, about 400 pounds per acre. As the winter season in this district is always more or less open and rainy, the writer is of the opinion that spring application of these fertilizers would prove the most profitable.

Most poor and exhausted soils usually respond best to a complete fertilizer ; that is, one that contains all three of the elements of plant food—nitrogen, phosphoric acid and potash. The proportion of each of these most economical to use must, however, be largely determined by the character of the crop to be grown, the nature of the past manuring and the results of careful experimenting on the soil with the crop under consideration. The amounts we have given in this report are those commonly employed ; more specific instructions require a knowledge of the circumstances. Those desiring further information on this subject are invited to place themselves in correspondence with this division.

NORTH-WEST TERRITORIES.

In August, 1899, samples of soil from the north-west quarter, section 21, township 23, range I, west of the fifth meridian, were received from the Commissioner of Agriculture for the North-west Territories, with a request for their analyses. Upon this tract of land the agricultural experimental station of the North-west Territories is situated (Calgary), and the location from which the samples were collected is the bench land of a valley falling away from the banks of the Elbow. Mr. Chas. W. Peterson, Deputy Commissioner of Agriculture, North-west Territories, writing of the soils, says that the valley at this point is about one mile in width, that a few poplars are appearing on the bench, and that cotton-woods and spruces are growing well on the river bottom. The soil from Plot 1 (*see* table of analyses) 'has been cultivated for a long time and is full of weeds.' The soil of plot 2 is 'virgin prairie, and well fitted for either cultivation or grazing.' Plots 1 and 2 are closely adjacent areas.

Two further samples from the North-west government, and collected on south-west quarter section 15, township 23, range 1, west of fifth meridian, were forwarded in December, 1899. Writing of these soils, Mr. Peterson says that : 'One (plot 3 in table) is taken from dry, unirrigated land, fifty feet from upper side of irrigation ditch, while the other (plot 4 in table) is taken from irrigated land, 50 feet from lower side of irrigation ditch and 100 feet from the foregoing sample. The surface soil on this area is from 2 to 6 inches deep, and the general character of the locality may be described as rolling prairie. Stunted poplars grow on south side of the valley, which is an old water course, 1,000 feet wide. Under irrigation it would make very good grazing land and produce fair crops of grain.'

All the foregoing surface soils were accompanied by their sub-soils, but, unfortunately, time did not permit the examination of the latter.

Analysis of Soils (water-free), North-west Territories, 1900.

Plot.	Locality.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Phosphoric Acid.	Soluble Silica.	Carbonic Acid, &c. (Undetermined).	Total.	Nitrogen.	Available. Soluble in 1% Citric Acid.		
													Potash,	Phosphoric Acid.	Lime.
1	NW. ¼ Sec. 21, T. 23, Rg. 1, W. 5th Mer.	18·61	73·05	6·32	1·08	0·35	0·44	0·25	0·02	....	100·12	0·660	·0320	·01069	0·592
2	NW. ¼ Sec. 21, T. 23, Rg. 1, W. 5th Mer.	13·69	76·71	7·69	0·71	0·43	0·52	0·21	0·01	0·03	100·00	0·530	·0349	·00928	0·498
3	SW. ¼ Sec. 15, T. 23, Rg. 1, W. 5th Mer.	16·12	76·56	6·30	0·90	0·90	0·38	0·24	0·08	....	101·48	0·549	·0279	·00390	0·440
4	SW. ¼ Sec. 15, T. 23, Rg. 1, W. 5th Mer.	15·30	75·52	6·39	1·28	0·98	0·38	0·18	0·05	....	100·08	0·574	·0353	·01201	0.568

Plot No. 1.—Surface soil, marked 'Cultivated': It has the appearance of a rich loam of good tilth and one capable of yielding good crops when supplied with a sufficiency of water. It is quite black from the presence of organic matter and presents very many features in common with the fertile, black loam of the prairie.

Plot No. 2.—Surface soil, marked 'Virgin prairie': Very similar in appearance to that of Plot 1, but its organic matter is more fibrous and consequently less humified.

Since in all essential particulars these soils are of the same nature and character, it will be of advantage to discuss their data together.

Both soils may be considered as light to medium loams, sand predominating, rich in plant food and especially so in organic matter and nitrogen. Tested with litmus paper, neither show acidity or alkalinity. A careful examination proves the absence of all deleterious and alkaline matter.

We cannot be said as yet to have established standards of fertility for Canadian virgin soils, but from the examination of a number of such soils we have arrived at certain limits between which most good agricultural soils are to be found. These limits as regards nitrogen, potash, phosphoric acid and lime, are discussed at length in the report of this Division for 1897, and in brief on pages 148, 149 of the present report. A reference to these figures and to the data presented in the foregoing table gives evidence of the excellent quality of both of these soils; they are undoubtedly well supplied in all the essential elements of plant food, a very fair proportion of which appears to be in a more or less immediately available condition.

Though the soil from Plot 1 is stated to be cultivated, and from Plot 2, as virgin prairie, a comparison of their data does not reveal any exhaustion of fertility in the former due to cropping; indeed, in several important features No. 1 is the better of the two. In potash only is No. 2 the richer. It is quite possible that these soils were not originally identical; but whether such be the case or not it is quite evident that they do not serve to illustrate that truth of which we have in past reports brought forward several instances, namely, that there is a marked decline in both 'total' and 'available' plant food, due to successive cropping in cases where no form of manuring has been practised.

A special inquiry in regard to these soils was with respect to their richness in lime. Though not ranking with calcareous soils, they certainly show a very fair percentage of this constituent and probably at present quite sufficient for the best returns. There is no reason to suppose that the herbage would be deficient in this element or that cattle and horses grazed thereon would be lacking in bone-forming elements. Evi-

dently the lime is not altogether in what might be termed a locked up condition, the percentage available being large. The ratio of the available to the total lime is the same for both soils.

Irrigated and Non-irrigated Soils.

The chief object in examining soils from Plots 3 and 4 was to ascertain what effect irrigation might have had upon the plant food present, sample No. 3 being from an unirrigated and No. 4 from an irrigated area.

In general appearance these samples are similar to Nos. 1 and 2—black loams of loose texture in which sand predominates. They both show a fair amount of fibre. No. 3 (not irrigated), is neutral to test paper ; No. 4 (irrigated), is very slightly alkaline.

The following deductions may be made from the chemical data : In 'total' potash the soils are alike ; in 'available' potash No. 4 is slightly the richer. In 'total' phosphoric acid, No. 3 is higher than No. 4, but the amount of this element immediately available in the latter is four times that in No. 3. Whether the greater proportion of available potash and phosphoric acid in No. 4 soil may be due to irrigation is not by any means clear, but the fact is worthy of note and deserving of further investigation. In nitrogen the percentages are almost identical. The irrigated soil (No. 4) shows a somewhat larger amount of lime, which may be due to the deposition of lime from the irrigation water, or more possibly brought up from the lower soil by capillarity induced by increased surface evaporation consequent upon irrigation. It will be noticed that the ratio of the 'available' lime to the 'total' lime is practically the same for both soils.

These, like Nos. 1 and 2, are soils of more than average fertility. Though not so heavy as the wheat lands of the prairie further east, they will undoubtedly give excellent yields, providing the climatic conditions, under which term we may include the water supply, are propitious.

NOVA SCOTIA.

From Annapolis county.—A sample of soil representative of much in the vicinity of Annapolis was submitted to us for examination and report. Messrs. T. S. and R. R. Bohaker, of Granville Ferry, N.S., in forwarding the soil say : 'We have several orchards planted on soil similar to the sample sent and they have not given us entire satisfaction for several years past. We are desirous of knowing what element is lacking, so that we may supply the deficiency and get the trees into better bearing. Would salt or lime be of value to this soil, and if so, in what quantity should they be applied? What other manures or fertilizers would you recommend ? Information on these points should be useful to a number of people in our neighbourhood.' This soil in the air-dried condition presents the appearance of a brownish-red, sandy loam. Its analysis shows it to be of much better quality than might be supposed from a casual inspection. The data are as follows :—

Analysis of Soil (air-dried).

Moisture	2·97
Organic and volatile matter	15·22
Mineral matter insoluble in acid	68·28
Lime	·26
Magnesia	·50
Oxide of iron and alumina	12·44
Silica (soluble)	·09
Phosphoric acid	·25
Potash	·37
	100·00
Nitrogen, in organic matter	·491

In potash, phosphoric acid and nitrogen, the foregoing data show it to be equal to the average fertile soil. Provided the season were favourable, especially as regards moisture, it should prove quite productive. It is to be remarked, however, that this soil has a decided acid reaction, and shows a deficiency in lime. This condition may account in a large measure for the poor returns spoken of by Messrs. Bohaker, for it has been abundantly demonstrated of late years that a sour condition, which is always associated with traces only of available lime compounds, is strongly detrimental to farm crops in general. An application of 30 to 40 bushels of lime per acre is, therefore, suggested as likely to bring about a more productive condition of the soil.

Since the soil contains but little clay, and consequently has a low absorptive capacity for moisture, it would be important from time to time that it should be replenished with organic matter, either by an application of manure or a green crop, such as clover, turned under. For maintaining the humus and nitrogen of orchard soil, there is, perhaps, no better or more economical plan than sowing clover in July and ploughing under during May of the following year, after which cultivation, to preserve a dry earth mulch, and thus prevent surface evaporation, should be practised until the clover is again sown. For field crops which allow of soil cultivation, such as corn and roots, this mechanical method for retaining soil moisture should not be neglected.

To enhance fertility by means of commercial fertilizers, we would suggest for the orchard and fruit trees generally a brand containing, say, 2 to 3 per cent nitrogen, 6 to 8 per cent available phosphoric acid, and 8 to 10 per cent potash—the application being from 300 to 500 pounds per acre. If it is desired to purchase these constituents separately, phosphoric acid may possibly be best applied as Thomas (Basic) slag. This fertilizer contains usually from 14 to 17 per cent of phosphoric acid, which, though present in a form not so immediately available as that in superphosphate, is better adapted to sour soils by reason of its alkalinity. Basic slag contains some 15 per cent of free lime, and hence neutralizes or counteracts acidity. The application may be 300 pounds per acre. Finely ground bone meal is also a good source of phosphoric acid for moist, warm soils of good texture. For potash, if wood ashes are not procurable, muriate of potash or kainit may be employed. Of muriate, 100 pounds per acre, and of kainit, 400 pounds per acre, is the usual dressing. Being an acid soil, nitrate of soda would be better than sulphate of ammonia to use as a source of nitrogen. The application may be from 100 to 150 pounds per acre, broadcasted in two or three dressings, say, of 50 pounds each, at intervals throughout the growing season. The nitrate can be mixed with several times its weight of dry loam to facilitate distribution.

For light and sandy soil, spring application of fertilizer is preferable, being spread on the ploughed land and lightly harrowed in. When nitrate of soda is used, it is furnished while vegetative growth is active, as already indicated.

CONSERVATION OF SOIL MOISTURE.

Experiments at Brandon, Man., and Indian Head, N.W.T.

We may, I think, confidently assert that among the problems to be solved in connection with agriculture in Manitoba and the North-west Territories that which seeks to secure and retain soil moisture for the use of the growing crop, is one of the most important. As yet, the necessity of returning plant food in manures and fertilizers is not generally felt, so rich is the soil over very large areas; but nevertheless there are elements, largely variable and uncertain, that have a most marked effect upon the yield. These elements or factors are chiefly two—rainfall and early frost. It is with the first of these, or rather the retention of the rain, that our present research has to do. The wheat yield of any year depends, as we well know, to a very large extent

upon the climatic influences that have prevailed throughout the season—and to a certain degree upon those of the preceding season.

The value of a moist seed bed for the germinating grain and an ample precipitation during May and June, is well known to all farmers in the North-west. This becomes the more apparent when we remember that an acre of wheat requires more than 300 tons of water to bring it to perfection, and that especially is the moisture necessary during the earlier stages of the wheat's growth.

Now, though it is obviously impossible for the farmer to control the rainfall, it is quite practicable and within his power, by proper methods of culture, to store up a large portion of the season's precipitation for the use of the crops of the succeeding year. To obtain data that might serve to corroborate this statement we commenced an investigation last spring on fallowed and cropped lands on the Experimental Farms at Indian Head, N.W.T., and Brandon, Man.

The plan of the investigation may be stated as follows:—Early in the spring on each of the farms two areas having as far as possible soil of a similar character were selected, the one (A) intended to be fallowed during the present season, and which had been cropped in 1899; the second area (B) to be cropped, but which had been fallowed in 1899. Samples from each of these areas were taken, month by month, from May to November inclusive, to two depths—the first (No. 1) representing the upper 8 inches ; the second (No. 2), the depth from 8 to 16 inches. These samples, taken in special canisters, were immediately on collection forwarded to the laboratory. On their arrival each canister of soil was at once weighed and its contents thoroughly mixed, sampled, and the moisture determined in duplicate. From the average weight of the canister of water-free soil (obtained from the seven monthly determinations) and the percentage of moisture, the amounts of water in tons and pounds per acre were calculated. The canisters (2½ inches by 8 inches) used were very stout and open at both ends. In taking the samples they were thrust into the ground until level with the surface and then removed with the aid of a sharp spade, and covered with deep and close-fitting caps. To prevent any possible evaporation en route, 'electric' tape was used to cover the edge of the cap or lid where it fitted over the canister.

Before discussing the results obtained, it will be of interest to consider in outline the general conditions as regards rainfall that prevailed in 1899, as well as this year. Mr. Bedford, writing of the season of 1899 at Brandon, says: "May was unusually wet and cloudy, with a low temperature, and seeding was frequently interrupted by rain. Rain was abundant during early June, followed by bright, warm weather later in the month. The temperature and rainfall during July and August was about normal. The fall months were unusually dry.' The total rainfall was 11¼ inches.

Regarding the season of 1900, Mr. Bedford says: 'There was no rainfall previous to May 11, the date when the first samples were taken, and the soil was exceptionally dry.' On May 26, he wrote: 'it still holds very dry here.' In a letter dated June 13, Mr. Bedford states: 'the weather has been exceedingly dry so far; in fact, we have had practically no rain of any value. This is very unusual with us, as our annual rains generally occur during the last half of May and the first two weeks of June. Our crops and suffering severely from the want of rain.' Under date of June 28, he says: 'It continues exceedingly dry here, and the grain has suffered terribly throughout the province.' On July 13, he writes: 'Between three and four inches of rain has fallen, and the soil is pretty well saturated. The wheat has improved somewhat, and there is a prospect of more than half a crop of coarse grain.' In a letter on August 14, he says: 'The rainfall during the past month has been 2·37 inches, which is unusually heavy for this time of the year.' Again on September 12, he says: 'The rainfall for the past month has been 5·34 inches, which is much heavier than we generally have at this season of the year.'

From the foreging, it is obvious that while the season of 1899 was characterized by a plentiful but normal precipitation, that of 1900 was exceptional and abnormal, it

being exceedingly dry during the earlier months of the summer and more than usually wet during the middle and later months of summer.

The records from the Indian Head Farm show that in 1899 the rainfall was fairly normal, the total precipitation being 9·44 inches, of which 1·35 inches fell in May, and 5·34 inches in June.

Of the present season, Mr. Mackay records similar weather conditions to those already stated for Brandon. Thus, on May 8, he writes: 'The weather for the past three weeks has been very dry and warm, with high winds prevailing almost every day.' On June 8, he says: 'We are having very bad, windy weather, with no rain of any use,' and then in September he states: 'We are having unusually wet weather and the outlook for grain still unstacked is far from bright.' Speaking of the season as a whole, Mr. Mackay writes, November 28, as follows:—'The past season has not been an average one for the test. The weather was too dry in May and June, and then in July, August and September it was unusually wet, causing the soil in Plot B with the growing crop to become much more moist than it otherwise would.'

The treatment of the soils may be summarized in the following statement:—

Brandon, Plot A.—In fallow 1900, was ploughed June 7 to a depth of 7 inches, the surface was cultivated with harrows and scuffler sufficient to keep down the weeds during the balance of the season.

Plot B.—In crop 1900, was ploughed on May 12, and sown the same day, and the crop harvested August 24; the yield was 32½ bushels of oats per acre. It was not ploughed after harvesting.

Indian Head, Plot A.—In fallow 1900, ploughed 8 inches deep between April 17 and 25; cultivated 2 inches deep four times, once each in May, June, July and August.

Plot B.—In crop 1900, ploughed 6 inches deep between June 1 and 15, 1899, cultivated 3 inches deep 3 times during July and August of that year, ploughed end of August 6 inches deep, but not ploughed or cultivated before seeding this year. Seed sown April 30. Grain harvested August 14, 1900.

The rainfall during the investigation, at Brandon and Indian Head, is tabulated as follows:—

Brandon, Man.	Inches.	Indian Head, N.W.T.	Inches.
May 11 to June 11	0·14	May 8 to June 8	1·08
June 11 to July 11	4·46	June 8 to July 8	1·85
July 11 to Aug. 11	2·37	July 8 to Aug. 8	2·44
Aug. 11 to Sep. 11	5·34	Aug. 8 to Sep. 8	2·83
Sep. 11 to Oct. 11	4·15	Sep. 8 to Oct. 8	3·81
Oct. 11 to Nov. 11	0·32	Oct. 8 to Nov. 8	0·10
Total	16·76	Total	12·11
NOTE—There was no rainfall previous to May 11.		NOTE—The rainfall previous to May 8 was 0·27 inches.	

TABLE I.—MOISTURE: Percentage and Amount per Acre:—In Soils at Brandon and Indian Head, 1900.

BRANDON, MANITOBA.

Date of Collection.	"A." In Fallow, 1900. In Crop, 1899.				"B." In Crop, 1900. In Fallow, 1899.			
	No. 1. (1 to 8 ins.)		No. 2. (8 to 16 ins.)		No. 1. (1 to 8 ins.)		No. 2. (8 to 16 ins.)	
	Moisture.		Moisture.		Moisture.		Moisture.	
	p. c.	Amount Per Acre.	p. c.	Amount Per Acre.	p. c.	Amount Per Acre.	p. c.	Amount Per Acre.
1900.		Tons. Lbs.		Tons. Lbs.		Tons. Lbs		Tons. Lbs.
May 11..	19·45	214 877	18·24	212 1780	25·55	325 216	22·92	301 1470
June 11..	17·40	187 247	18·30	231 106	20·63	246 519	23·00	303 286
July 11..	25·88	310 366	22·35	296 1896	26·80	366 161	23·27	307 1579
Aug. 11..	26·73	325 497	23·62	319 107	22·38	273 305	12·72	167 260
Sept. 11..	27·47	335 1335	21·62	285 1649	27·79	364 1323	21·31	274 1685
Oct. 11..	25·40	302 878	20·68	269 139	26·73	345 1329	20·54	262 622
Nov. 11..	27·43	335 1054	23·79	320 862	25·65	326 1597	20·96	280 184

INDIAN HEAD, N. W. T.

Date of Collection.	"A." In Fallow, 1900. In Crop, 1899.				"B." In Crop, 1900. In Fallow, 1899.			
	No. 1. (1 to 8 ins.)		No. 2. (8 to 16 ins.)		No. 1. (1 to 8 ins.)		No. 2. (8 to 16 ins.)	
	Moisture.		Moisture.		Moisture.		Moisture.	
	p. c.	Amount Per Acre.	p. c.	Amount Per Acre.	p. c.	Amount Per Acre.	p. c.	Amount Per Acre.
1900.		Tons. Lbs.		Tons. Lbs.		Tons. Lbs.		Tons. Lbs.
May 8...	22·03	264 260	21·32	276 1627	25·87	385 1320	25·55	324 1371
June 8...	23·52	287 1028	17·81	219 1860	26·76	341 37	26·68	344 513
July 8...	24·39	301 1188	22·38	292 1166	23·62	288 1281	18·35	212 1217
Aug. 8...	24·78	307 1860	19·28	242 916	25·05	311 1745	19·07	222 1774
Sept. 8...	24·16	297 1585	21·65	280 948	21·28	252 628	20·50	243 1732
Oct. 8...	25·26	315 1912	22·39	292 1729	27·60	355 1605	22·07	267 1886
Nov. 8...	25·79	324 1652	22·83	300 654	26·14	330 353	23·35	288 436

TABLE II.—MOISTURE:—Amount per Acre to depth of 16 inches.

Date.	Brandon, Man.				Date.	Indian Head, N.W.T.			
	A. Fallowed, 1900. Cropped, 1899.		B. Cropped, 1900. Fallowed, 1899.			A. Fallowed, 1900. Cropped, 1899.		B. Cropped, 1900. Fallowed, 1899.	
1900.	Tons.	lbs.	Tons.	lbs.	1900.	Tons.	lbs.	Tons.	lbs.
May 11..........	427	657	626	1,686	May 8..........	540	1,887	700	691
June 11........	418	353	749	805	June 8..........	507	888	685	550
July 11..........	607	1,262	673	1,740	July 8..........	594	354	501	498
Aug. 11..........	644	604	440	565	Aug. 8..........	550	776	534	519
Sept. 11...	621	984	639	1,008	Sept. 8.........	578	533	496	360
Oct. 11..........	571	1,017	607	1,951	Oct. 8..........	608	1,641	623	1,491
Nov. 11........	655	1,916	606	1,781	Nov. 8.... ...	625	306	618	789

Considering first the data obtained on the Brandon soils, it is to be noticed that the soil in fallow last year (B) contained, during May, June, and July of the present year, both in the first and second eight inches more moisture than soil to corresponding depth from the area that was cropped last year. This will be more apparent by consulting Table II., from which the following results are obtained :—

	Tons.	Lbs.
May 11, 1900, excess of moisture in land fallowed, 1899, per acre	199	1,029
June 11, 1900, excess of moisture in land fallowed, 1899, per acre.......	331	452
July 11, 1900, excess of moisture in land fallowed, 1899, per acre......	66	478

Between June 11, and July 11, the large excess of moisture previously present in soil (B) fell off rapidly, and was reduced to between 60 and 70 tons per acre. This in all probability was due to two causes ; the first, the greater absorptive and retentive power of soil (A)—in fallow 1900—to hold the rainfall of the month 4·46 inches (see table), and secondly, the large moisture requirements of the growing crop on soil (B). These factors continued evidently in a more marked manner from July 11, and August 11, so that at the latter date a reversal of the previous conditions had taken place and the soil in plot A now contained 204 tons moisture more than that in plot B. The draught by the growing grain on the moisture on this latter plot would be at its maximum this month—a fact that well explains our results.

Leaving out of consideration the data of plot A for October—regarding which we cannot at present offer any explanation—it will be observed that there is a constant tendency for the soil moisture in both fallowed and cropped soil during the latter months of the experiment to approximate. This is evidently due to the unusual wet autumn (see table of rainfall), the evaporation being slight. However, results show that on November 11, when the last samples were collected, the fallowed soil contained about 50 tons of moisture per acre more than in the cropped soil, the evaporation from the latter naturally being greater. Under more normal conditions we might, judging from our early results, expect a much larger excess of moisture in the fallowed soil.

Turning to the Indian Head samples, we find a similar condition during the early months of the season as at Brandon. Thus, the moisture in the fallowed land of 1899, over and above that of cropped land of that year was as follows :—

	Tons.	Lbs.
May 8, 1900, excess of moisture in fallowed land of 1899....	159	804
June 8, 1900, excess of moisture in fallowed land of 1899....	177	662

The July analyses give data in the same direction as those of August for Brandon, namely, less moisture in soil B (cropped 1900). The causes, we may suppose, are the same as those already indicated as exerting an effect at Brandon, the lighter rainfall at Indian Head accounting for the earlier appearance of the deficiency in soil moisture in the cropped land. This condition continued to prevail throughout July, August, and September, as seen by consulting Table II., from which the subjoined data are calculated :—

	Tons.	Lbs.
July 8, 1900, excess of moisture in fallowed land of 1900, per acre....	92	1,859
August 8, 1900, excess of moisture in fallowed land of 1900, per acre....	16	257
September 8, 1900, excess of moisture in fallowed land of 1900, per acre....	82	173

During the last two months of collection, the moistures in the cropped and fallowed soils, as in the case of the soils at Brandon, tend to approximate, but showing in the last determination, as also observed in the Brandon soils, a slight excess of moisture in the land fallowed during the present year.

The foregoing are without doubt most instructive and valuable data. The season, especially the earlier part, was a particularly favourable one for the investigation ; the drought that prevailed during the spring and early summer months emphasizing in a most marked manner the beneficial effect of the previous year's fallowing. It is exceedingly satisfactory to note that the results at both points of observation are in so large a measure confirmatory of one another, and that they afford such strong evidence of the value of fallowing as a means of storing up moisture for the crop of the succeeding year.

Further work another season when climatic conditions of a more normal character prevail, must be done. In addition to a repetition of the tests here presented, it is proposed to include the determination of moisture in soil growing the second crop after fallow, for it seems the practice of sowing grain on stubble land—quite a common one—often results in failure when the rainfall of the season is light.

NITRIFICATION IN NORTH-WEST SOILS.

Nitrification is the term applied to the process whereby the organic nitrogen of the soil is converted into nitrates—compounds which are the source of available nitrogen to crops. It is carried on in the soil by certain germs or micro-organisms which flourish on the humus or nitrogenous vegetable matter, providing conditions of warmth and moisture are favourable and a salifiable base, as lime, is present.

The warm, moist months of summer is when nitrification goes on most rapidly. But it is, nevertheless, essential to the best results that the growing grain should have access to an ample supply of this soluble nitrogenous food at a period in the spring or early summer, when frequently nitrification is but tardy. During such a

period, the young plants must rely largely on the nitrates produced the previous season. Unfortunately for the agriculturist, nitrates are extremely soluble compounds and consequently are washed down out of the reach of the roots of the young plants, if heavy rains have prevailed the previous autumn or winter.

On the supposition that there was excessive leaching of the nitrates from the surface soil in the North-west during the autumn and winter months, it has been suggested by an English agricultural writer that an application of nitrate of soda in the spring to the growing grain would be of much value and greatly increase the yield. While this may be true in part in certain, what we may term, exceptional seasons, as the past one—which was characterized by a heavy rainfall in the late summer months—it is not, in all probability, the case usually, for in Manitoba and the North-west Territories the rains of the year, as a rule, are during the latter part of May and in June, and the autumn is fair and dry. Further, the winters are usually very cold and dry, and consequently not conducive to leaching. To this we may add, the soils generally over the wheat-growing areas are a heavy clay loam of a retentive character.

Be this as it may, it was thought desirable to determine from month to month the amount of nitrates in the surface soils (1 to 8 inches) already referred to as examined for their moisture content. The method adopted was to weigh out 100 grams of the fresh soil and add thereto 1,000 c.c. of ammonia-free distilled water and shake the mixture well for one hour. It was then allowed to settle for one hour and the free ammonia in an aliquot part at once determined. A further quantity was at the same time set aside in contact with a zinc-copper couple (by means of which nitrates are reduced to ammonia) and at the expiration of twenty-four hours distilled. From the free ammonia in the distillate the amount previously found deducted and the remainder calculated to nitrogen, and recorded as nitrogen in nitrates in one million parts of the water-free soil. The results are set forth in the subjoined table :—

NITROGEN in Nitrates and Nitrites—Results recorded in parts per million of water-free soil.

Date.	Brandon, Man.		Date.	Indian Head, N.W.T.	
	In Fallow, 1900. In Crop, 1899.	In Crop, 1900. In Fallow, 1899.		In Fallow, 1900. In Crop, 1899.	In Crop, 1900. In Fallow, 1899.
1900.			1900.		
May 11........	10·62	11·45	May 8.........	3·37	16·22
June 11........	15·21	28·20	June 8.........	6·93	25·70
July 11........	10·99	7·65	July 8.........	22·30	20·00
Aug. 11.........	17·94	8·42	Aug. 8.........	22·70	17·20
Sept. 11.........	10·67	5·51	Sept. 8.........	16·71	7·20
Oct. 11.........	4·55	7·91	Oct. 8.........	12·20	7·32
Nov. 11.........	2·53	6·40	Nov. 8.........	3·99	3·97

In considering the foregoing data, it would be well to keep constantly in mind that in two very important features the season of 1900 was abnormal in the North-west—an unusual drought in early summer and an exceptionally heavy rainfall in the autumn months. Under these conditions, we may suppose the loss of nitrates during the late autumn was greater than is ordinarily the case.

Brandon.—Soil in fallow 1900. With certain minor fluctuations, which I think may be accounted for in a large measure by the rainfall, the amount of nitrates keeps up until the early part of September, when it rapidly falls, evidently owing to the heavy rains already referred to, which washed the nitrates beneath the first 8 inches of soil. It has already been remarked that the season of 1899 was more or less normal in character, and it is probably from this fact that the soil in May possessed such a fair amount of nitrates. The largest amount was obtained in the sample taken August 11, no doubt due chiefly to the moisture that fell the preceding month promoting the nitrification process.

On the soil cropped in 1900 we find, as might be expected, a falling-off after the June sample was collected, due undoubtedly to the wheat crop making its draught upon this nitrogenous food.

Indian Head.—Soil in fallow 1900. This soil, probably owing to a very favourable physical condition, gave large amounts of nitrates throughout the summer, but these, as in the case of the Brandon soils, rapidly fell off during October from the cause we have advanced.

Soil in crop 1900. The soil, similarly, was richer in nitrates than the corresponding Brandon sample, but in a general way showed the same falling-off as the season advanced, due to the crop's requirements.

It is to be confessed that the present investigation gives support to the view that the nitrates are largely lost to the surface soil during the late autumn months, but whether this occurs in normal seasons to the extent here indicated is very doubtful. Further work is necessary to determine this point. It seems clear, however, that fallowing encourages the development of the nitrates.

FERTILIZERS.

MARL.

This material consists essentially of carbonate of lime, but considerable amounts of organic matter, sand and clay, frequently are present. It occurs in beds of varying thicknesses in old lake and pond bottoms, and on the margins of many existing bodies of water, showing their former extension. Usually it is overlaid with peat or swamp muck. It has arisen from the breaking down of countless fresh-water shells, many of which, however, still retain their form, and thus give the name shell marl to the deposit. It is very widely distributed in Canada, samples from beds of marl from almost every large area in the Dominion having been examined in our laboratories. The better and purer marls of Ontario are now being largely used for cement-making.

Considered agriculturally, marl must be regarded rather as an amendment than a fertilizer ; improving the tilth, neutralizing acidity and promoting nitrification, are amongst its chief functions, though it has a distinct value as a supplier of lime (an element of plant food) for soils deficient in that constituent.

The application of marl is especially to be recommended for heavy, plastic clays, for very light soils deficient in lime, and for those in which humus predominates. It renders the tilth of the former mellower, allowing air to permeate the soil and the roots to spread more easily ; its addition improves sandy soils, by making them heavier and more retentive of moisture and fertilizing materials. In the slow oxidation of the

organic matter of peaty soils, it aids in the conversion of their nitrogen into forms which can be taken up as food by plants. This beneficial process is brought about by certain microscopic plants in the soil, known as the ferments of nitrification, the development of which is greatly encouraged by the presence of carbonate of lime. To all soils deficient in lime, as we have said, it may advantageously be applied, furnishing thereby not only plant food, but also setting free in the soil the inactive stores of mineral matter, so that such may be assimilable by vegetation. Lime in all its forms has proved of special value as a manure for the leguminosæ—of which pease, beans, &c., are important members.

A good marl for agricultural purposes should be of a light colour, and not of a hard or flinty nature. It should easily disintegrate or break down on exposure to the weather, allowing a ready mixture with the soil.

New Brunswick.—Two samples, from the upper and lower layers of the deposit, have been received from Dawsonville. The upper and darker layer was a mixture of muck (decayed vegetable matter) and marl ; the lower layer of a light-gray colour, proved to be entirely composed of shell marl. This latter sample was submitted to analysis, with the following results :—

Moisture	68·91
Organic and volatile matter	4·66
Carbonate of lime	21·90
Oxide of iron and alumina	·87
Clay, sand, &c	2·56
Magnesia, &c., by difference	1·10
	100·00

This is a very good marl. If piled and allowed to dry out, a saving could be effected in connection with its hauling. Simply drying by exposure would result in a marl containing from 60 to 70 per cent of carbonate of lime.

Specimens of marl from the Macdonald beds, Restigouche, have also been recently examined by us. The samples were forwarded by Mr. John McAllister, M.P., Campbellton, N.B. :—

	No. 1. Surface.	No 2. 15 feet below Surface.
Insoluble rock matter	15·03 p.c.	75·05 p.c.

No. 1 is a marl of very fair quality.

No. 2 is very poor and of very little value agriculturally, owing to the large excess of inert material.

Nova Scotia.—In many districts where the soil is deficient in active lime, and where deposits of marl to supply this deficiency are not available, it frequently becomes of importance to farmers to learn if lime can be obtained by burning the rock of the neighbourhood. In this connection the following letter and analysis will be of interest. Mr. James W. Stairs, of Halifax, writing under date of June 11, 1900, says :—'I send you two samples of limestone from Meagher's Grant, Musquodoboit, Halifax county. Will you please analyse them and let me know if they will furnish lime fit for farming purposes? There is a large mass of it, and if on burning we can obtain good lime, we shall be able to furnish our farms with a much needed constituent. There must be hundreds of thousands of tons in the deposit ; it extends over a large tract of country.'

Our analysis and report is subjoined :—

	Large Specimen.	Small Specimen.
Carbonate of lime	53·92	52·08
Carbonate of magnesia	39·23	39·90
Oxide of iron and alumina	....	4·06
Insoluble rock matter	3·24	2·06

For all practical purposes, these samples may be considered identical. They are not true limestone, but that variety known as magnesian or dolomitic limestone. Owing to the presence of the carbonate of magnesia, a 'fat' lime cannot be obtained on burning this rock—it can only furnish 'poor' lime, that is, one that slakes badly. This fact, however, should not deter farmers from burning this limestone when their soil is in need of lime. We have no doubt it will yield, when well burnt, a most useful fertilizer for all such soils.

Island of Anticosti.—A very large deposit of marl, probably 150 acres in extent and of unknown depth, exists at Ellis Bay, Lake Mignon, which is about one-third of a mile in the interior of the island. Having received a request for an examination and report on this material as a fertilizer from M. Comettant, Governor of the island, we submitted a sample to analysis with the following results :—

Analysis of (air-dried) Marl.

	Per cent.
Moisture	2·65
Vegetable and organic matter	13·87
Sand and clay	25·78
Oxide of iron and alumina	2·93
Carbonate of lime	52·52
Phosphoric acid	Traces.
Potash	·42

We reported on this marl in the following terms :—

These data show this material to be marl of fair quality. Judging from its composition, as well as from its mechanical condition, it should prove a valuable amendment for all sour, peaty and heavy clay soils, as well as for all soils deficient in lime.

Phosphoric acid is present only in traces, and the percentage of potash is not larger than that in many soils of good average fertility. From these facts it is clear that this substance cannot be used as a substitute for fertilizers supplying these elements of plant food.

The proportion of semi-decayed vegetable matter (humus) present slightly enhances the value of the marl, more especially if it is to be applied to light soils, poor in organic matter.

GYPSUM OR LAND PLASTER.

Among the naturally-occurring fertilizers of Canada, gypsum or land plaster must be considered as one of the most valuable and important. As, however, it does not contain either nitrogen, potash or phosphoric acid, it is not in any sense comparable to commercial fertilizers, the value of which lies in the percentages of these constituents they contain. Gypsum is sulphate of lime* and, therefore, as a direct supplier of plant food can only furnish sulphur and lime; but as an indirect ferti-

*Pure gypsum is composed of lime 32·5 per cent, sulphuric acid 46·5 per cent, and water 21·0 per cent ($CaSO_4$, $2H_2O$.)

lizer it has an additional value in liberating in an available form potash from its locked-up stores (the double silicates) in the soil. It may, therefore, in a sense be considered a potassic fertilizer. For this reason especially, it has been found of benefit for leguminous crops, such as clover, beans and pease, plants which respond readily to treatment with potash. As a manure for turnips, Indian corn and many leafy crops, it has also been used profitably, as well as for top-dressing grass lands, in which it encourages the growth of the clovers. Very poor soils give but little return, as a rule, from a dressing of gypsum—on such it must be supplemented by a more complete manure—but on rich soils and with the afore-mentioned crops it is wont to give an immediate return.

From an agricultural stand-point, however, one of the most valuable properties of this material is that of 'fixing' or retaining ammonia. Rather than apply it directly to the soil, we, therefore, advise its use as an absorbent in the stable and cow-house, where, sprinkled on the floor, it will prevent the loss of ammonia from the fermenting urine. Thus, the atmosphere of these buildings is rendered more whole-some for the farm animals, and the manure made more valuable. A sample of gypsum sent by Mr. J. R. Mosher, Kempt Shore, N.S., and recently analysed by us, afforded the following data :—

	Per cent.
Insoluble rock matter	2·99
Calcium sulphate (gypsum)	91·80
Undetermined mineral constituents	5·21
	100·00

It is evidently a very good sample.

Former analyses of samples from Nova Scotia made in the Farm Laboratories may be tabulated as follows:—

	A.	B.
Insoluble rock matter	15·85	·48
Calcium sulphate (gypsum)	68·65	97·53
Oxide of iron and alumina	3·91	Traces.
Calcium carbonate	4·98	....
Magnesium carbonate, &c. (undetermined)	6·61	1·99
	100·00	100·00

Gypsum occurs in Canada, essentially, in large irregular masses, from a few yards to one-quarter of a mile in extent, and from 5 to 8 feet in thickness.

In Ontario, it is more especially found in large lenticular masses, interstratified with dolomitic rocks, in the vicinity of Paris and along the Grand River, between Paris and Cayuga. It is also quarried in large quantities in New Brunswick and Nova Scotia, occurring in vast deposits near Hillsboro,' Petitcodiac, along the Tobique River, N.B., and at Wentworth and Montague, in Hants county, and other places in Nova Scotia.

WOOD ASHES.

Attention has frequently been directed to this home-produced fertilizer, more particularly as a source of potash, and analyses of samples collected in various parts have from time to time appeared in our reports. The composition of wood ashes must

necessarily be somewhat variable, but there are limits within which all genuine unleached ashes should be found. Exposure and leaching will lower the percentage of potash and increase the proportion of water, while careless collection or the intentional addition of sand or other inert matter will further lessen their value. For these reasons it would, therefore, be advisable to purchase only on guaranteed analysis.

Since wood ashes sell for less than $10 per ton, their examination is not made with that of other fertilizers by the Inland Revenue Department, under the Fertilizer Act. This fact furnishes an additional reason for the necessity of farmers and orchardists, when purchasing car lots, insisting on a certified statement as to the fertilizing value of the ashes, or else taking a representative sample and having it submitted to analysis by a chemist of repute.

We are not of the opinion that there is much intentional adulteration in Canada, but it is certainly true that occasionally very poor samples have been received by us from correspondents. A notable case, illustrating this fact, is the following:—In May of the current year, a correspondent in Waterville, N.S., asked us to examine a sample of ashes from a carload which he and other farmers were buying together. Though such an examination does not come within the regular scope of our work, the circumstances as stated seemed, on investigation, to warrant us in making an exception, and the analysis was made. The data are as follows:—

	Per cent.
Moisture	26·93
Insoluble mineral matter	5·82
Potash	2·59
Phosphoric acid	·74

These figures should be compared with the subjoined, which are the averages obtained by the Massachusetts Experiment Station from the analysis of 476 samples of Canadian hardwood ashes, sold in that state :

	Per cent.
Moisture	10·64
Insoluble mineral matter	14·22
Potash	5·37
Phosphoric acid	1·52

In our laboratories we have found a variation in apparently genuine samples from 5 to 12 per cent potash, and we are of the opinion that good, unleached ashes do not, as a rule, fall below 5·5 per cent potash. It is obvious, therefore, in the case under consideration that a loss of approximately 50 per cent of potash had taken place by exposure or by intentional leaching. In other words, valuing the potash at 6c. per pound, a ton of ashes analysing 5½ per cent potash would be worth for potash alone $6.60, while the Waterville sample would only be worth $3.11 per ton. It is evident from this consideration that the question of composition is worthy of attention on the part of those who purchase this fertilizer.

WOOL WASTE.

As pointed out in our report for 1890, this material has frequently a notable value as a fertilizer from the amounts of nitrogen and potash it contains. Thus, in a sample then analysed, we found 1·31 per cent nitrogen, and 3·56 per cent potash. That this waste product, however, is quite variable will be obvious on comparing these data with those about to be given, and which have recently been obtained on the analysis of a sample from the Oxford Mills, N.S.

Analysis of Wool Waste, Oxford Mills, N.S.

	Per cent.
Moisture	6·90
Ash or mineral matter	10·86
Mineral matter insoluble in acid	8·50
Phosphoric acid	0·09
Potash	0·26
Nitrogen	4·38

The amounts of phosphoric acid and potash are so small that they may be disregarded, the only fertilizing element of value present being nitrogen. This exists to the extent of 87 pounds per ton. Since the nitrogen in wool waste is not a condition assimilable by plants, it becomes necessary, or at any rate advisable, to submit the material to fermentation, as in the compost heap, before application to the soil. To this end it may be mixed with wood ashes or lime, or composted with actively fermenting manure. The sample under comment was found to contain 31·15 per cent of oil or fat. This would prevent the ready decomposition of the waste and certainly reduce very much its fertilizing value. The amount of oil is so large that one is prompted to predict its economic recovery would be quite practicable.

FODDERS AND FEEDING STUFFS.

Our investigation relating to the composition of Canadian forage crops and feeding stuffs has included during the past year certain leguminous plants and grasses grown in the experimental plots under the direction of Dr. Fletcher, several varieties of mangels, carrots, turnips and sugar beets from the crops of 1900, rape at various periods of growth furnished by the Agricultural Division, besides many feeding stuffs of which samples have been received for analysis.

The value of a cattle food, from the feeding standpoint, depends upon its composition and digestibility. It becomes, therefore, important to have some knowledge of the character of a fodder's constituents and of the functions of those constituents in the animal system. We consequently in the following paragraphs, explain in brief these matters, and thus afford information that will be of assistance in understanding the data detailed in tables of analyses.

Water.—The percentage of water present depends upon the nature of the fodder. In roots there is about 90 per cent; in green fodders, e.g., corn and grass, there is usually between 70 per cent and 80 per cent, according to variety, time of year, &c.; in hay we find about 14 per cent, and in cornmeal, oil-cake, and milling products generally, between 7 per cent and 12 per cent.

Although water is as necessary to the animal as it is to the plant, yet on account of its abundance in nature no value can be assigned to it in fodders. It must not be forgotten, however, that succulency, a most important quality, influencing greatly both the palatability and digestibility of a food, is due chiefly to the presence of the natural or original water. It is succulency that gives to many green fodders a value, as for milk production, above that apparently indicated by their composition.

During the maturing of many foliaceous plants, such as grass, Indian corn, &c., the withdrawal of water, accompanied by other changes, tends to lower somewhat the digestibility and hence the value of some of the constituents. Hence some plants may be more nutritious in their green and succulent state than they are when ripe and dry, in spite of the fact that in the latter condition the solid food materials may largely exceed that found in the green and immature fodder.

Fat.—Of the non-nitrogenous constituents, fat has the highest nutritive value; and this chiefly because it contains a larger percentage of carbon than fibre, or the carbohydrates, in the burning of which in the blood much heat is evolved. By its combustion, fat generates the greater part of the heat of the body. Its high value is largely due, also, to the fact that it can be transformed into fatty tissue of the animal much more readily than the other organic ingredients. It aids the digestion and assimilation of the albuminoids and preserves them from undue waste.

Fibre—Is the least valuable of the food ingredients. It is the part of plants that in part corresponds in function to that of the bones of animals, viz., the supporting and strengthening of the other tissues. By chemical means it can be separated from the other parts of a fodder as a fibrous or woody material. As plants mature, the fibre, as a rule, becomes less digestible, chiefly owing to the deposition of ligneous or woody matter. In composition and function, fibre is similar to the 'Nitrogen-free extract.'

Nitrogen-free Extract or Carbo-hydrates.—Under these terms are included starch, sugars and many allied substances forming, usually, the larger part of the dry matter of a fodder. Their function in the animal economy is to produce heat and energy, though under certain circumstances they may become a source of fat.

Protein or Albuminoids.—These substances constitute the nitrogenous portion of the fodder. They are certainly the most important and most valuable of all the nutritive ingredients, for in the animal economy they alone can play the part of flesh producers, entering into the composition of muscle and cartilage and bone and furnishing essential constituents for the vital fluids—blood and milk. They may also serve in the production of fat, and in the development of heat and energy.

Ash or Mineral Matter—Is that part left when a fodder in the course of analysis is burned, an operation that destroys and dissipates the organic matter. It is composed chiefly of lime, magnesia, potash and soda, combined with phosphoric, hydrochloric and silicic acids. The functions of these materials in the animal are to assist in the formation of bone (largely composed of phosphate of lime) and to furnish that small quantity of mineral matter found in all animal tissues. It also replaces those saline substances daily excreted.

THE CHEMISTRY OF RAPE.

During the past few years the growing of rape—a plant which, as far as Canada is concerned, may be considered a newly introduced fodder—has been receiving increased attention from our farmers. In certain districts it is now largely used as a forage crop for sheep, swine and steers, and undoubtedly still larger areas in the future will be sown for this purpose. It seemed desirable, therefore, that we should determine by analysis the food value of this plant, so that its true position as regards other coarse or forage crops could be arrived at, and, further, that we should ascertain what changes in its composition affecting its nutritive value take place as it advances towards maturity.

To this end, samples were collected from the rape crops on the Central Farm during the past season at several stages of the plant's growth and submitted to analysis. The variety grown was Dwarf Essex, and the seed was sown at the rate of 4 pounds per acre in drills 30 inches apart. The data are given in tabular form to facilitate comparison of the composition of the plant at different stages. In addition to analyses of the whole plant, an examination was made of the stalks and foliage, separately, of the somewhat mature rape plant.

ANALYSIS OF RAPE—C. E. FARM, 1900.

Number.	Date of Sowing.	Date of Collection.	Days of Growth.	Height of Plant.	Fresh Material.								Water-free Substance.						
					Water.	Fat.	Fibre.	Nitrogen free Extract.	Crude Protein.	Alb'd Nitrogen.	Non-Alb'd Nitrogen.	Ash.	Fat.	Fibre.	Nitrogen free Extract.	Crude Protein.	Alb'd Nitrogen.	Non-Alb'd Nitrogen.	Ash.
1	June 23..	July 24..	31 days...	12 in....	93·20	0·12	0·83	2·01	2·20	0·20	0·15	1·64	1·77	12·20	29·64	32·32	2·98	2·19	24·07
2	" 16..	" 24..	38 " ...	20 in....	93·80	0·11	1·02	2·00	1·75	0·16	0·12	1·32	1·75	16·51	32·29	28·19	2·57	1·93	21·26
3	May 19..	" 24..	66 " ...	31 in....	93·16	0·07	1·34	2·59	1·45	0·14	0·09	1·39	1·07	19·57	37·93	21·27	2·11	1·28	20·16
4	" 19..	Aug. 10..	83 " ...	34 in....	92·34	0·06	1·56	4·02	0·98	0·09	0·07	1·04	0·88	20·42	52·33	12·79	1·12	0·92	13·58
5	" 19..	" 24..	97 " ...	44 in....	89·86	0·09	2·48	4·69	1·35	0·13	0·09	1·53	0·89	24·44	46·28	13·33	1·30	0·84	15·06
6	" 19..	" 24..	97 " ...	44 in....	85·10	0·02	5·83	6·29	1·21	0·19	0·003	1·55	0·15	39·14	42·20	8·11	1·27	0·022	10·40
7	" 19..	" 24..	97 " ...	44 in....	90·75	0·14	1·77	4·32	1·51	0·14	0·098	1·51	1·52	19·14	46·72	16·28	1·54	1·06	16·34

NOTE.—Samples 1 to 5 inclusive consist of the whole plant minus the root, that is, of the stem and leaves. No. 6 consists of the stalk, and No. 7 of the leaves, taken from plants similar to those analysed as No. 5.

It is very evident from the large percentage of water present throughout the whole life of the plant that rape is to be classed as a succulent forage crop. For this reason (its high water content) it cannot be preserved in the silo, nor, on account of the crumbling to powder of its leaves on drying, can it be cured on the field. It is, therefore, consumed, either on the field or by soiling, by the animals as it grows, and thus all expense in harvesting saved.

Dry Matter.—Though the variation in the composition of the plant throughout its period of growth is not great, there is a well marked tendency in certain directions that we may call attention to. In the first place, it is to be noted that while there is not much change as regards water content during the earlier two months of growth, there is from that period on a gradual increase in the percentage of dry matter. Thus, in rape one month old we found 6·80 per cent dry matter, while in that three months old (when the whole plant was still edible), there was 10·14 per cent dry matter. It is apparent, therefore, that, judged from this consideration solely, the older plants, weight for weight, would have the greater fodder value. This increase in the amount of dry matter seems to be due principally to the larger proportion of stalk to foliage in the more mature rape. Thus, in Nos. 6 and 7 we have the composition in detail of the stalks and foliage respectively of plants of the same age as those recorded under No. 5. These show that the stalks contain approximately 5·5 per cent more dry matter than the foliage. After the plants have reached a certain and more advanced stage of growth this apparent benefit is, however, to some extent offset by the greater development of fibre in the stalks, making them hard and unpalatable, and to some degree no doubt less digestible. The foliage always contains much less fibre than the stalks.

The changes that take place in the composition of the dry matter during the period of growth are best understood from a study of the data recorded for the water-free substance.

Fat.—Usually a number of substances, of which chlorophyll is the chief, are included with the fat when employing the ordinary process employed for fat estimation. In the case of seeds, meals, and feeds of a similar character, no great error is introduced by such a determination (since from these materials the solvent takes nothing but fat), but in the case of green fodders the difference between the crude fat (including resins, gums and chlorophyll) and the true or pure fat or oil is frequently very large. Hence, we decided in these analyses to employ a discriminating method, and the figures given, therefore, represent true fat.

It would seem that the younger plants are the richer in fat, and this evidently in a large measure is due to the fact that the proportion of foliage to stalks is greater in them than in the more mature plant. This would probably not hold true to so great an extent in rape grown broadcast. The stalks (No. 6) are seen to contain but one-tenth the amount of the fat in the foliage (No. 7).

Fibre.—As might be expected, the percentage of this constituent increases with the age of the plant. The stalks are naturally more fibrous than the leaves (compare Nos. 6 and 7), and since they (the stalks) are more prominent as the season advances the analysis of the whole shows an increasing fibre content. In speaking of the relative development of stalk to leaf, it may be of interest to state that in the rape collected August 24, the proportion of stalk (taken from the ground to the base of the lowest leaf) to leaf was 1 to 4, by weight. In rape sown broadcast, the proportion of stalk would probably be much less.

Crude Protein.—This term is applied in a comprehensive sense and is used to include all the nitrogenous substances of the plant. In the case of seeds—including grains of all kinds and their milling products—this involves but little error, since practically all their nitrogen exists in the true albuminoid form. For such substances the amount of 'crude protein' is a true indicator of their food value for furnishing

the nitrogenous portion of the ration, for it really stands for albuminoids, which, as already stated, are the most important of all food constituents in maintaining life and building up of the animal tissues. With green and immature fodders, however, the term 'crude protein' comprises not only the albuminoids, but also other nitrogenous substances (nitrates, amides, &c.), which, it may be remarked, have a very much lower feeding value—indeed, it is not probable that these compounds are a source of nitrogen to the animal system. In order to ascertain the proportion of these two forms of nitrogenous compounds and thus arrive at a more correct knowledge of the feeding value of rape at different periods of its growth, we determined the nitrogen present in the non-albuminoid compounds, as well as in the true albuminoids. A survey of the data will reveal that as the plant grows the proportion of the latter to the former increases, and, therefore, the nitrogenous matter of the older plants is more valuable from the food standpoint; in other words, the non-albuminoid nitrogenous substances tend to decrease with the growth of the plant. This statement, however, must be considered in connection with another fact, made equally clear by our data, namely, that as the season advances the rape shows a falling off of both the albuminoid and non-albuminoid nitrogen. Weight for weight, the younger plant is richer in both classes of these compounds than the older rape. This is due to the fact that the assimilation of nitrogen from the soil by the plant goes on more rapidly during the first month or six weeks of growth than later. The larger yield per acre obtained from a crop three months old compared with that of two months, very largely offsets this decline in the percentage of albuminoids, and no doubt makes it desirable from an economic standpoint in many instances to allow the crop to come to the more mature period, provided always that the plant is not becoming unpalatable from the development of hard and fibrous stalks.

Nitrogen-free Extract or Carbohydrates.—The percentage of nitrogen-free extract increases greatly in the fresh fodder, as well as in the dry matter, during the latter weeks of growth.

Ash or Mineral Matter.—A comparison of the percentages of this constituent in the dry matter makes it evident that it is more particularly during the earlier weeks of growth that the rape plant makes its greatest draught upon the available stores of mineral plant food in the soil.

To sum up the foregoing observations, we may conclude: (1) that the rape plant of four to six weeks old contains more water and less dry matter than that of three months; (2) that the *dry matter* of the younger plant is relatively richer in fat and albuminoids (protein) than that of the older rape; (3) that the non-albuminoid nitrogenous compounds decline as the season advances; (4) that the percentage of fibre increases with the age of the plant, due to the greater development of stalk; (5) that the nitrogen-free extract increases with the growth of the plant; (6) that the percentage of ash in the dry matter decreases as growth progresses. It would appear, therefore, that on the whole the *dry matter* of the six weeks old rape has a higher feeding value than that of rape of three months' growth, but that, owing to the increased percentage of dry matter in the mature plant and the much larger yield of crop obtained from the latter, the feeding value per acre at the more advanced period of growth is the greater. And this will probably be more emphasized in rape sown broadcast than in drills, as the proportion of stalk to foliage in the former will be less.

The fact that the assimilation of the soil plant food elements takes place chiefly during the first six weeks of growth points to the benefit to be derived from a thorough preparation of the soil.

Compared with other forage crops, rape, although it possesses a large percentage of water, takes a high place, owing to its, comparatively speaking, large percentage of nitrogenous constituents (albuminoids). In this respect it closely resembles clover and other legumes, which, for the same reason, are justly considered to have a feeding value above most of the grasses and root crops in general.

LEGUMES.

The leguminosæ, to which clover, pease, beans, vetches, &c., belong, are characterized by a high nitrogen content (protein), and consequently furnish fodder of greater feeding value than grasses, roots and many other forage plants. Several members of this family have from time to time been analysed in the Farm laboratories, and their composition published. (The reader is referred especially to the report of the Chemical Division for 1893). During the past summer further samples have been collected from the 'grass plots' of the farm and submitted to analysis. The data obtained are given in the following table :—

ANALYSIS of Legumes—1900.

Samples were collected on July 4, 1900, when all the plants were in full flower.	Fresh Material.						Water-free Substance.				
	Water.	Fat.	Fibre.	Nitrogen—free Extract.	Crude Protein.	Ash.	Fat.	Fibre.	Nitrogen—free Extract.	Crude Protein.	Ash.
Wild Pea from North Bay... (Lathyrus maritimus.)	81 01	·24	5·35	7·63	4·22	1·55	1·28	28·19	40·14	22 22	8·17
Grass Pea.................. (Lathyrus sativus.)	87·06	·11	3·66	4·74	3·03	1.40	·84	28·29	36·60	23·44	10·83
Wagner's Wood Pea......... (Lathyrus sylvestris Var Wagneri)	83·66	·05	5·60	5·05	4·49	1·15	·31	34·25	30·94	27·45	7·0
Purple Tufted Vetch .... (Vicia Cracca.)	74·91	·12	7·20	10·20	5·49	2·08	·49	28·69	40·67	21·87	8·28

For the botanical information in the following paragraphs I am indebted to Dr. James Fletcher, Botanist of the Experimental Farms.

Wild Pea or Seaside Pea (*Lathyrus maritimus*), from North Bay.—A deep-rooted, free-growing and very persistent perennial, stout and succulent, somewhat fleshy leaves with 6 to 12 leaflets ; flowers, 6 to 10 inches long ; racemes, long, purple. Judging from the analysis, this plant should afford a rich fodder, and since it gives a large yield it is certainly worthy of trial. It is stated that cattle eat it with relish.

Grass Pea, Chickling Vetch (*Lathyrus sativus*).—An annual with a weak, winged stem, with solitary flowers and compound leaves of four long and narrow leaflets. A good fodder, either green or cured, especially for sheep, now extensively grown in western Ontario on account of the seed being exempt from the attack of the pea weevil. From the great length of its growing and flowering period, it should form an excellent soiling crop.

Wagner's Wood-pea (*Lathyrus sylvestris Wagneri*).—A fodder plant introduced a few years ago, receiving extensive advertising and stated to do well even on poor soils. It is a free-growing leafy pea. In its second year of growth at the Experimental Farm, Ottawa, it produced a thick mass of leafy stems, nearly 4 feet in height. Analysis shows it to be extremely rich in nitrogenous matter (protein). Though cattle do not first evince a liking for it, it is said by English writers that they soon eat it with relish, both in the green condition and as hay. On account of its high feeding value and the large yield per acre to be obtained, it may become an important addition to our present list of forage and soiling crops.

Purple-tufted Vetch (*Vicia Cracca*, L.).—A deep-rooted and very persistent perennial ; leaves with about 20 leaflets ; flowers, violet and blue, in clusters of about 30, but producing few good seeds; stems, slender, requiring some other plant, such as rye, to support them. It is much relished by stock, and undoubtedly is an excellent fodder. Of the four examined, this plant showed the highest amount of dry matter.

ROOTS.

In connection with a series of feeding trials with steers conducted by the Agricultural Division, it became of importance to learn the respective food values of certain roots. We accordingly submitted to analysis, from the crop of the present year, three varieties of mangels, two of carrots, three of turnips, and one of sugar-beets—the latter from the crop under (a) special culture, and (b) ordinary field culture. The information thus obtained will, it is hoped, prove of interest to all farmers and stock-raisers, for, as will be noticed, large differences in feeding value sometimes exist even between two varieties of the same class of roots.

Though in many parts of Canada the corn crop has to a very large extent displaced roots, there appear to be areas of considerable magnitude (as in the Maritime provinces) better adapted by reason of local climatic conditions to the growth of roots. But whether corn can or cannot be grown advantageously, should not alone decide the question as to the culture of roots. It is true that more feed per acre can be obtained from glazed corn than from roots—and that it furnishes feed which in a measure may replace the grain of the ration while at the same time acting as a succulent fodder. It is also true that roots contain a large percentage of water and that the 'dry-matter' is not rich in protein. Nevertheless, roots by reason of their ready and practically complete digestion, their succulent nature, and what may be termed their medicinal properties—due to their richness in saline matter—have been found by stock-feeders of long experience to be an exceedingly valuable constituent of the ration. It is probable that they aid materially in the digestion of the rest of the food, and no doubt also prove useful in the proper extension of the digestive apparatus. Roots are essentially non-nitrogenous, their dry matter having a wide nutritive ration (1: 8 to 1: 13), and consequently cannot be used economically, save as part of the ration.

ANALYSIS of Roots, Central Experimental Farm, Ottawa, 1900.

	Fresh Material.							Water-free Substance.				
	Water.	Fat.	Fibre.	Nitrogen-free extract.	Crude Protein.	Ash.	Sugar in Juice.	Fat.	Fibre.	Nitrogen-free extract.	Crude Protein.	Ash.
Gate Post Mangel............	88·80	·03	·85	8·64	·82	·80	6·15	·31	7·64	77·47	7·36	7·22
Giant Yellow Globe Mangel ..	91·81	·02	·69	5·24	1·24	1·00	2·64	·2[illegible]	8·49	63·89	15·13	12·26
Golden Tankard Mangel	89·75	·03	·77	7·83	·82	·80	4·78	·32	7·53	76·32	8·00	7·83
Imp'd Short White Carrot.....	91·54	·07	·87	5·93	·83	·76	2·99	·81	10·41	69·90	9·86	9·02
Guerande or Ox-Heart Carrot .	88·36	·14	·90	8·37	1·19	1·04	4·72	1·26	7·77	71·79	10·24	8·94
Skirvings Turnip..............	89·65	·01	1·17	7·48	1·03	·66	1·54	·12	11·30	72·27	9·93	6·38
Champion Purple Top Turnip..	89·23	·01	1·31	7·79	·85	·81	1·46	·12	12·19	72·32	7·88	7·49
Rennie's Prize " " ..	89·64	·004	1·17	7·45	1·07	·66	1·63	·04	11·33	71·94	10·30	6·39
Sugar Beet 'Ordinary Culture'..	79·65	·04	1·18	16·85	1·32	·96	16·43	·21	5·80	82·81	6·47	4·71
Sugar Beet 'Special Culture'...	78·51	·04	1·16	18·08	1·39	·82	16·98	·20	5·39	84·10	6·47	3·84

Since the 'dry matter' of roots may for practical purposes be considered as entirely digestible, the relative feeding value of the different varieties will be in proportion to the percentage of dry matter they contain and the richness of that dry matter in protein. The amount of fat present is so small that it does not call for special consideration. In addition to the usual fodder analysis, a determination of sugar in the juice of the root was made.

Mangels.

The percentages of dry matter in the three varieties examined are :—

	Per cent.
Gate-Post, red	11·14
Giant Yellow Globe	8·19
Golden Fleshed Tankard	10·25

Weight for weight, therefore, the 'Gate-Post' is much the more valuable mangel, containing approximately one-fourth more dry matter than the 'Giant Yellow Globe', which in this respect, it will be remarked, is the poorest of the three varieties examined. The 'Gate-Post' mangel is, further, characterized by a high sugar content, a feature of considerable importance from the feeding standpoint.

The 'Giant Yellow Globe' mangel presents several peculiarities of composition. In the first place, the percentage of dry matter is small, while that of the nitrogenous organic matter is exceptionally large for this class of root. Our experiments go to show that approximately 50 per cent of the nitrogenous matter exists as true protein. The 'Golden Fleshed Tankard' occupies a place very close to that of the Gate-Post.'

Carrots.

The dry matter of the varieties examined may be stated as follows :—

	Per cent.
Improved Short White	8 46
Guerande or Ox-Heart	11·64

From these data we may conclude the last named variety to have the greater feeding value. Not only is it the more valuable from a larger percentage of dry matter, but also from the better quality of that dry matter. This fact is revealed by the data expressing the percentages of sugar in juice, of protein and of fat, all of which are higher in the case of the Ox-Heart carrot.

Turnips.

The three varieties of turnips analysed yielded the following percentages of dry matter :—

	Per cent.
Skirvings	10·35
Champion Purple Top	10·77
Rennie's Prize Purple Top	10·36

Not only from the above data, but also from those of the detailed analysis, it will be observed that such differences in composition as exist are very slight.

Sugar Beets.

In order to learn what improvement in feeding value might result by giving sugar beets that special culture necessary for roots intended for the sugar factory, samples of Vilmorin's Improved, grown respectively under ordinary and special culture at the Experimental Farm, Ottawa, have been analysed. With the exception of, practically, 1 per cent more dry matter in the beets of special culture, the results are exceedingly close. The figures denoting the composition of the water-free substance are for the most of the determinations almost identical. It is, therefore, improbable that there would be any adequate return for the expense involved in giving the beets 'special' culture when they are intended for feeding purposes, and more especially would this be the case if, as is usual, there were a larger yield per acre when grown under ordinary field conditions. The samples analysed contained about 21 per cent of dry matter, three-fourths of which is sugar. Sugar beets are very valuable feed. It is stated, however, that if fed largely, sugar beets cause scouring.

In considering the value of different root crops, not only the composition, but the yield and cost of production per acre should also be taken into account.

COTTON-SEED MEAL.

Numerous inquiries have been received during the past year regarding the composition and use of this concentrated feed stuff, which, as far as many districts are concerned, may be considered as a newly introduced feeding material.

The following determinations have been made on samples recently forwarded for examination:—

	No. 1	No. 2.
Crude protein (albuminoids)......	43·87	43·37
Crude fat or oil.....	11·63	13·11

No. 1 was sent by Mr. F. W. Davidson, Anagance, N.B. No. 2 was received from Mr. G. E. Stopford, Tidnish, N.S., and bore the label of the American Cotton Oil Co., St. Louis, Mo., guaranteeing protein 43·00 per cent, and fat or oil 9·00 per cent. It is believed that No. 1 is from the same source. Both samples are fully equal to the guarantee; indeed, as regards oil, a valuable fodder constituent, they are considerably richer than called for by the vendor's statement.

Information respecting the general use and feeding value of cotton-seed meal is given on page 149 of our report for 1899, where there also will be found a comparative account of the chief concentrated feeds in common use.

BRAN.

Two samples of bran were received from Mr. J. H. Pillar, Russell, Ont., with a request for information as to which of them had the greater feeding value. A partial analysis afforded the subjoined data:

	No. 1.	No. 2.
Moisture.....	11·51	11·31
Protein (albuminoids)....	13·64	13·62
Ash.....	6·32	6·00

No. 1 is to a slight degree the brighter in colour of the two, and contains somewhat fewer buckwheat hulls. However, as far as chemical analysis can determine, these brans are practically identical in feeding value; indeed, the figures would

probably not have been closer if both samples had been taken from the same bin. Mr. Pillar writes that these brans were selling in his neighbourhood for $18 and $16 per ton, respectively. The analysis, as we have seen, does not show any such difference in value.

The quality of a bran may be well adjudged from its appearance and freedom from weed seeds and other foreign material.

COCOA-NUT MEAL.

This feeding stuff is the residue after extraction of the oil from the flesh of the cocoa-nut. It is a pleasant-tasted, soft material, of a clean, bright appearance, and is evidently palatable and appetizing.

A sample forwarded by Messrs. Stairs, Sons & Morrow, Halifax, N.S., and imported by A. Cumming & Son, Port of Spain, Trinidad, furnished the following data:—

Analysis of Cocoa-nut Meal.

Moisture	14·65
Fat	5·92
Fibre	11·19
Protein or albuminoids	21·37
Nitrogen-free extract or carbo-hydrates	41·34
Ash	5·53
	100·00

Cocoa-nut meal as a cattle food is practically unknown in Canada, but has earned a good reputation in Europe and certain of the United States (notably in the vicinity of San Francisco), being used more particularly for dairy cows, sheep and swine. The percentage of protein is high, making it a concentrated feed stuff, and it is also rich in fat. These facts, together with the palatableness of the meal, make this food a desirable constituent in the grain ration, provided always that it can be purchased at a reasonable price compared with the various grains and milling products generally used.

CORN MEAL.

In a communication from Mr. A. Broder, M.P., Morrisburg, Ont., who forwarded this sample, the doubt was expressed as to its genuineness. Our analysis, however, makes very clear that it is of excellent quality, and that nothing had been added to it or taken from it.

	Per cent.
Moisture	9·29
Protein	9·69
Fat	4·42
Carbo-hydrates (starch, &c.)	74·33
Fibre	1·01
Ash	1·26
	100·00

Comparing these figures with the published averages of corn meal, a less percentage of moisture is to be noticed in the present sample, which has the effect of increasing the percentage of the other constituents, and thus enhancing its feeding value.

LOW GRADE FLOUR FEED.

This sample was also submitted by Mr. Broder. It had the appearance of a low grade or perhaps slightly damaged flour ; it was quite dark in colour. Under the microscope no trace of other grain than wheat was detected. The data are as follows :—

	Per cent.
Moisture	9·17
Protein	14·85
Fat	3·36
Fibre	·02
Carbo-hydrates (starch, &c.)	71·02
Ash	1·58
	100·00

Such materials can undoubtedly be used to advantage as part of the grain ration, when they can be purchased at a reasonable price. The present sample, it will be noticed, is much richer in protein, though somewhat poorer in fat, than corn meal. The lower grades of flour often contain the germ of the wheat, and for this reason show a higher protein content, making their feeding value greater than that of ordinary flour.

CHICAGO STOCK FEED.

From time to time cattle tonics, condiments and special foods are largely advertised, and their sale pushed by energetic agents. The claims for such are at times preposterous, and their price far in excess of either the cost of their constituents or their worth to the farmer. Such a 'food' condiment was received for analysis in March last from the *Farmer's Advocate*, London, Ont., who in turn received it from a correspondent in Norfolk, Ont. It bore the name of the Chicago Stock Food. It was shown that it had been sold in parts of Ontario at the rate of 30 cents per pound (see *Farmer's Advocate*, March 15, 1900). The request from the *Farmer's Advocate* reads as follows :—

'LONDON, ONT., March 15, 1900.

'Under another cover we mail you a package containing about a pound of the Chicago Stock Food, which is being sold by agents in some parts of the country at exorbitant prices to farmers. One person who was imposed upon wrote us particulars of the matter and sent us a small sample, but not enough for analysis, so we wrote him a second time, and have received what we are now sending you. We should very much like to have a statement from you as to what the food contains, so that its commercial value compared with other foods may be estimated. In the current issue of the *Farmer's Advocate* we have an editorial referring to the matter, and it would certainly emphasize the point and put others on their guard throughout the country if it was shown by your examination that the food is one of about ordinary value.

'(Signed) The WILLIAM WELD CO., Limited.'

Our analysis of this food or tonic furnished the following data :—

	Per cent.
Moisture	8·38
*Ash	13·26
Protein or albuminoids	15·74
Fat	6·37
Fibre	5·15
Carbo-hydrates	51·10
	100·00

*Containing saline ingredients.

This condiment consists largely of finely ground linseed meal or cake, to which has been added common salt, saltpetre and copperas (sulphate of iron). It has been flavoured by the addition of a small amount of fenugreek.

The prices generally asked for such condition powders are far in excess of their value, whether such materials be considered as medicine or food, or both. The stock feeder or dairyman will find it greatly to his profit to obtain such medicine or treatment as his animals may at any time require rather than to pay exorbitant prices for materials which may or may not benefit his stock, and the nutritive value of which is certainly less than many concentrated feed stuffs on the market.

SUGAR BEETS.

MANITOBA.

In August of the current year we received a communication from the Winnipeg Board of Trade informing us that the Department of Agriculture of Manitoba had undertaken at the board's request a series of experiments in the growth of sugar beets, and asking for an examination of these beets in the farm laboratories. As no analyses had been made by us of sugar beets raised in Manitoba, and as apparently there were no data on record concerning the relative richness of the root as grown in that province, it was decided to undertake the investigation. It was thought desirable at the same time that beets grown on the experimental farms at Brandon, Man., and Indian Head, N.W.T., should be tested, and to this end samples of the six varieties under test at these farms were received, and, together with those forwarded by Mr. Hugh McKellar, Chief Clerk, Department of Agriculture, Winnipeg, Manitoba, submitted to analysis. The particulars of growth of the roots from Winnipeg are furnished by Mr. McKellar in Table I.; their analytical data are given in Table II.

TABLE I—SUGAR BEETS, MANITOBA—1900.

Number.	Name.	Address.	Variety of Beets.	Dates.			Distance between		—
				Sowing.	Thinning.	Pulling.	Rows.	Plants in row.	
							inches.	inches.	
1	A. Hutchings	Winnipeg	Klein Wanzleben, Impd.	June 14	July 18	Oct. 16	17	6	Very light sandy soil.
2	A. Hutchings	"	New Danish, Impd	" 14	" 18	" 16	17	6	Near river bank.
3	R. de Vries	Louise Bridge	Impd. Vilmorin	" 14	" 20	" 10	16	6	Heavy black soil on prairie.
4	R. de Vries	"	Klein Wanzleben, Impd.	" 14	" 20	" 10	16	6	
5	Klaas de Vries	"	New Danish, Impd	" 13	" 18	" 10	16	6	Heavy black soil 18 inches deep.
6	Klaas de Vries	"	Klein Wanzleben, Impd.	" 13	" 18	" 10	16	6	Over yellow clay subsoil.
7	Hugh McKay	Fernton	Impd. Vilmorin	" 13	" 25	" 15	16	6	Black soil with a little sand.
8	Hugh McKay	"	Klein Wanzleben, Impd.	" 13	" 25	" 15	16	6	
9	John de Graaf	Louise Bridge	Impd. Vilmorin	" 11	" 19	" 9	16	6	Same soil as 5 & 6.
10	John de Graaf	"	Klein Wanzleben, Impd.	" 11	" 19	" 9	16	6	
11	Jacob de Vries	"	Klein Wanzleben, Impd.	" 12	" 19	" 15	16	6	Same soil as 5 & 6.
12	Jacob de Vries	"	Impd. Vilmorin	" 12	" 19	" 15	16	6	
13	D. de Graaf	"	Impd. Vilmorin	" 28	" 21	" 12	16	6	Stiff heavy black soil.
14	D. de Graaf	"	New Danish, Impd	" 28	" 21	" 12	16	6	
15	W. Herries	"	Impd. Vilmorin	" 12	" 19	" 10	16	6	Same soil as 5 & 6.
16	W. Herries	"	New Danish, Impd	" 12	" 19	" 10	16	6	
17	John P. Haarsma	"	New Danish, Impd	" 14	" 21	" 15	18	6	Black loam with a little sand.
18	John P. Haarsma	"	Klein Wanzleben, Impd.	" 14	" 21	" 15	18	6	Near river bank.

Beets were thinned when plants were from $1\frac{1}{2}$ to 2 inches high and cultivated at that time, then cultivated once during the season. The beets all grew well down in the ground.

TABLE II—ANALYSES OF SUGAR BEETS FROM MANITOBA—1900.

No.	Variety.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root. Lbs.	Oz.
1A	Wanzleben Improved	10·9	15·4	70·7	—	12
1B	" "	11·8	15·6	75·6	—	13
2A	New Danish "	9·9	14·2	69·7	1	3
2B	" "	10·1	14·2	71·1	1	2
3	Vilmorin's "	9·1	13·3	68·4	1	6
4	Wanzleben "	8·9	13·8	64·4	1	5
5	New Danish "	9·7	14·3	67·8	—	12
6	Wanzleben "	11·9	15·8	75·3	—	10
7	Vilmorin's "	10·3	14·9	69·1	1	2
8	Wanzleben "	7·3	10·4	70·1	1	
9	Vilmorin's "	9·2	13·8	66·7	1	
10	Wanzleben "	9·9	14·4	68·7	1	5
11	" "	11·3	15·4	73·3	1	
12	Vilmorin's "	9·9	14·3	69 2	1	3
13	" "	8·4	12·7	66·1	1	7
14	New Danish "	10·5	14·8	70·9	1	4
15	Vilmorin's "	8·7	13·5	64·5	1	
16	New Danish "	9·8	14·1	69·5	—	15
17A	" "	9·5	14·0	67·8	1	
17B	" "	11·1	15·2	73·0	1	7
18A	Wanzleben "	12·5	16·4	76·2	1	1
18B	" "	11·0	15·6	70·5	1	4

The sugar content is not high and the co-efficient of purity is low ; indeed, the results are far from encouraging. It will be remembered, however, that the weather during the early part of the season, both in Manitoba, and the North-west Territories, was extremely dry ; for this reason, the beets failed to get a proper or early start. Mr. McKellar writes : 'So discouraging was the drought that several farmers who got seed did not sow it, while some that sowed it cultivated the plants down, thinking it useless to leave them.' The exceptional dryness of the soil when the seed was sown and the almost entire lack of rain until the latter part of July undoubtedly militated greatly against the normal growth of the roots and the production of sugar. This drought was followed by very heavy rainfalls in August and September—months that should be warm and dry for a high sugar content.

Since in many instances the percentage of sugar is notably increased during the last two or three weeks of the beet's growth—especially if climatic conditions are favourable—duplicate samples from plots Nos. 1, 2, 17 and 18 were taken by Mr. McKellar on November 1—a fortnight after the date of the first collection. These are designated in the table as 1 B, 2 B, 17 B, 18 B, respectively. In three cases out of the four there had been an increase in the saccharine matter, but in all probability this would have been more marked in a normal season ; for the heavy rains, it is reasonable to suppose, had induced vegetative growth rather than the storing up of sugar.

The results obtained on the beets grown at Brandon and Indian Head are given in Table III.

TABLE III—ANALYSES OF SUGAR BEETS FROM MANITOBA AND N. W. T.—1900.

No.	Variety.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root. Lbs.	Oz.	Grown at Experimental Farm.
1	Danish Red Top..........	7·4	10·6	69·5		12	Brandon, Manitoba.
2	Wanzleben................	8·5	12·5	68·1		15	" "
3	Danish Improved	7·2	11·4	63·4		12	" "
4	Red Top Sugar...........	7·8	11·8	65·8		15	" "
5	Vilmorin's Improved.....	9·8	13·2	73·7		11	" "
6	Improved Imperial.	7·4	11·6	63·6		13	" "
1	New Danish Improved....	10·6	14·2	74·6	1	10	Indian Head, N.W.T.
2	Wanzleben...............	9·5	13·4	70·9	1	9	" "
3	Danish Improved.........	7·9	11·6	67·6	1	13	" "
4	Red Top Sugar...........	7·7	11·4	67·5	1	15	" "
5	Vilmorin's Improved.....	11·6	14·8	78·4	1	9	" "
6	Improved Imperial........	6·6	10·8	61·1	2	2	" "

Their treatment at Brandon may be outlined as follows : 'Land in fodder corn in 1899 ; ploughed once and harrowed in spring 1900. Seed sown May 15, roots taken up October 3. Rows 30 inches apart and plants left standing about 9 inches apart in the rows.' Mr. Bedford continues : 'The roots are unusually small, owing to the severe drought of spring and early summer.'

The particulars furnished by Mr. Mackay are : 'Land fallowed 1899, ploughed 5 inches deep and harrowed in spring 1900. Seed sown May 18, roots pulled September 28. Distance between row, 28 inches, distance between root, 7 to 8 inches.'

As regards quality, i.e., sugar content and purity of juice, these beets are no better than those grown at or near Winnipeg. We feel, therefore, obliged to state that the present results have not given any indication of roots sufficiently rich and pure as to be suitable for sugar manufacture.

It is obvious that we are not yet in a position to speak definitely as to the possibility of growing in Manitoba a beet with a high sugar content, owing to the exceptional character of the past season, the fact that all the roots examined did not receive special attention or culture necessary for the best results, and that the samples represent but two localities in the province. Further work another year, when the season is normal, will be necessary to determine that question. It is only right, however, to point out that in many parts of Manitoba the climatic conditions for the purpose of sugar beet growing, which must comprise a sufficient and well distributed rainfall in the early months of growth, a high mean summer temperature and absence of early autumn frost, are not such as to lead us to regard with sanguineness the prospect of obtaining many areas that could furnish an ample supply of rich beets, without which, of course, profitable sugar manufacture would be impossible.

ALBERTA.

At the request of the Department of Agriculture for the North-west Territories, we have examined two samples of sugar beets grown at Magrath and Stirling, Alta., by the Canadian North-west Irrigation Company, of Lethbridge, Alta. Regarding these roots, Mr. C. McGrath, manager of the company, writes : 'The samples forwarded consist of thirteen beets, the four larger ones from Magrath, the others from Stirling —all grown on sod. We were unable to supply either of these settlements with water from our canal system during the past season, owing to the fact that the ditches have only recently been completed. The settlement at Magrath got more rain than Stirling, hence the former place has supplied the larger beets.'

On arrival of the beets at the farm laboratories, it was found that they had dried out considerably, and consequently would show a higher percentage of sugar than present when dug. Of course, it was impossible to ascertain the degree to which concentration of the juice had taken place. Our results are as follows:—

Locality.	Number of roots in Sample.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Coefficient of Purity.	Average Weight of one Root. Lbs.	Oz.
Magrath	4	15·19	21·02	72·26	1	9
Stirling	9	17·32	22·12	78·3		11

Though undoubtedly the above percentages are exceedingly good, especially when we remember that the roots were grown on sod, I do not think it would be safe to consider them as necessarily indicating that the Lethbridge district would always yield beets with a high sugar content. The fact, already referred to, of the drying out of the beets and the small number examined make it desirable that further data be obtained before final conclusions are drawn.

PRINCE EDWARD ISLAND.

The question of the possibility of growing in Prince Edward Island beets rich enough to make sugar extraction profitable having recently received considerable attention in that province, we have analysed, at the instance of Mr. A. Callaghan, Charlottetown, a number of roots raised there at various points during the past season.

The information furnished respecting them is very meagre and simply states that 'the seed was sown in the middle of June and the crop was harvested November 10. The drills were 18 inches apart, and the beets about 6 inches apart in the drill.' In all, 18 roots were sent. Table IV. sets forth our analytical and other data:

TABLE IV.—Analyses of Sugar Beets from Prince Edward Island, 1900.

Number.	Number of Roots in Sample.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root. Lbs.	Oz.	Locality.
1	3	12·0	16·5	72·8	1	13	Port Hill.
2	2	15·5	19·2	80·7	1	7	"
3	4	15·2	18·4	82·4		13	Freeland.
4	3	14·9	18·4	81·1	1	2	Conway.
5	3	12·8	17·1	74·5	1	4	"
6	3	13·1	17·5	74·7	1	9	"

The foregoing results show that these beets are for the most part rich in saccharine matter; indeed, they compare very favourably with those grown for sugar manufacture in Europe and the United States. Judging from the sugar content and degree of purity, I am of the opinion the averages obtained indicate that a beet suitable for profitable sugar extraction can be grown in Prince Edward Island. The amount of work done in this investigation is not sufficient, however, to allow us to speak definitely or decisively as to the success of the industry, if it were established.

The roots in sample 'A' had not been properly earthed, and, as a result, their percentage of sugar was lower than in the other samples. From the appearance of

the beets of this sample, about one-third of the root had been developed above ground, a feature which should always be avoided, since it tends to a low sugar content and an excess of certain substances that make difficult the extraction of sugar.

MANITOBA WHEATS.

A COMPARATIVE STUDY OF RED FIFE, PRESTON, STANLEY AND PERCY WHEATS.

As is well known, Red Fife wheat has long been recognized as the standard of excellence for growth in Manitoba and the North-west Territories, yielding a flour rich in gluten and of a high bread-making value. Since, however, this valuable wheat does not always ripen in certain districts before there is danger from frost, Dr. Saunders, Director of the Dominion Experimental Farms, commenced, some years ago, an investigation which had for its object the production of a wheat or wheats of equal value in vigour, productiveness and milling properties with Red Fife, but which would ripen a week to ten days earlier than the latter wheat. The method employed by Dr. Saunders was to cross the Red Fife with earlier ripening varieties (chiefly from Northern Russia), and to grow the cross-breds so obtained, noting their quality, the period required for maturity, &c. Among the wheats so originated are the Preston, Stanley and Percy, the parentage of which is as follows:—

Preston—Ladoga female with Red Fife male.

Stanley—Ladoga female with Red Fife male.

Percy—Ladoga female with White Fife male.

These wheats were originated by Dr. Saunders in 1888, and since that date have been grown in increasing quantities on the experimental farms and elsewhere.

To compare these cross-breds, as regards composition, with Red Fife, analyses have been made from samples of the crop of 1899 grown at the Experimental Farm, Indian Head, N.W.T. The results are tabulated as follows:—

ANALYSES OF WHEATS.

Name.	Locality Grown.	Crop.	Weight per bushel.	Weight of 100 kernels.	Moisture.	Albuminoids	Fat (ether extract.)	Crude Fibre.	Ash.	Carbohydrates.	Wet Gluten.	Dry Gluten.
			Lbs.	Grams								
Red Fife..	Indian Head, N.W.T	1899	63	3·402	10·68	12·84	2·46	1·85	1·29	70·88	31·39	13·31
Preston...	" " .	1899	62¼	3·415	11·56	11·86	2·58	1·93	1·35	70·72	27·83	11·99
Stanley...	" " .	1899	63¼	3·4852	11·06	13·16	2·42	2·04	1·41	69·91	33·38	13·47
Percy	" " .	1899	63¾	3·6136	10·15	13·67	2·41	2·14	1·66	69·97	34·98	14·72
Average	....	....	63⅛	3·4789	10·86	12·88	2·47	1·99	1·43	70·37	31·89	13·375

It will not be necessary to discuss in detail the above data, since in previous publications (see especially Bulletin No. 4) we have considered fully the relative values to be assigned to the various constituents when judging of the merits of a wheat. Speaking generally, we may say that the strongest and best wheats, from the baker's standpoint, are those with the highest percentage of gluten (which must be of a firm, elastic quality), and the lowest percentage of moisture.

Judged by accepted chemical standards, all four wheats examined are remarkably good, and compare most favourably with average market samples of the best wheats of the world. This is evidenced by their uniformly excellent percentages of albu-

minoids and of wet and dry gluten, their low percentage of moisture, and their satisfactory weights per bushel and per 100 kernels.*

A feature particularly worthy of note is the remarkable similarity in composition throughout the series. This shows the close relationship of the wheats. Critically examining the data, it will be seen that of the cross-breds, Preston only falls behind the parent in albuminoids ; both Stanley and Percy show higher percentages in this constituent than Red Fife. The best of the series appears to be the Percy, since it gives slightly higher numbers than any of the others in weight per bushel, weight per 100 grains, and percentages of albuminoids and wet and dry gluten. It also contains the least moisture. As far as could be judged, the quality of the gluten was equally good in all.

Attention may be directed more especially to two estimations throughout the series, and which seem to call for special comment : we refer to the moisture and the fat. The former is much lower than that usually found, even in north-western wheats, and demonstrates the high bread-making value of those varieties ; the latter, an important constituent, is considerably above the average. We are at the moment at a loss to account for this almost abnormal percentage of fat (the usual average being about 1·85 per cent), but consider it from the nutritive point of view as an important and valuable feature.

THE NORMAL PERCENTAGE OF MOISTURE IN WESTERN WHEATS.

From several communications received during the earlier months of the current year, it appeared that considerable apprehension was felt by the millers regarding the moisture content of much of the 1899 wheat crop from parts of Manitoba and the North-west Territories. Thus in a letter under date of February 19, 1900, the Northern Elevator Company, of Winnipeg, write : 'There has been much discussion lately about the percentage of moisture contained in Manitoba wheat of the crop of 1899. It would seem that in the wheat from the western districts there is a greater percentage of moisture than in that grown in the eastern portion of Manitoba. The following is a memorandum showing the percentage on carload recently shipped, and which were tested by the Ogilvie Milling Company :—

	Per cent.		Per cent.
Moosejaw	16·31	Emerson....	13·8
Wolseley	15·07	Virden....	16·25
Pettapiece....	15·62	Virden....	13·2
Gretna, Carberry, Winkler, Altona.....			12·85

'The general supposition is that the normal percentage of moisture in wheat should be 12·5, and the excessive percentage of moisture in wheat in the western portion of the country has given rise to some speculation as to the keeping qualities of such wheat. As we have large quantities in store in country elevators, we are naturally interested in the matter and should feel very much obliged if you will favour us with your opinion.'

Undoubtedly this assertion, if correct, might mean considerable loss, for an excessive moisture-content in the wheat leads to an inferior quality of the flour. On this point Jago, in his work on the 'Chemistry of Wheat, Flour and Bread,' page 236, says :—

'The question of importance is the influence of water on the quality of the grain or flour, and the interpretation to be placed on such results as are here given. As may readily be supposed, a wheat that is grown either in a naturally damp climate, or

* Analytical data of a large number of Canadian and foreign wheats will be found in the Report of the Chemical Division of the Experimental Farms for 1895.

during an unusually wet season, contains more water than one grown under the opposite conditions. Taken into consideration without reference to the other constituents of the grain, a large proportion of water is to be deprecated, for the very simple reason that water is scarcely worth purchasing at the price given for wheat or flour. This however, is not the only objection to the presence of a large percentage of water; a much more serious objection is based on the fact that such high proportions show that the wheat is unsound, and that in all probability the other constituents will not be of the most promising character. In the first place, damp wheats and flours favour the development of those organisms which produce mustiness or acidity. In the presence of excess of moisture, too, the gluten of flour is rendered soluble in part, and also loses in elasticity. Further, more or less of the starch will be found to have been degraded into dextrin and maltose by diastasis.'

Considering, therefore, that it was desirable in the interests of both farmers and millers to ascertain the correctness or otherwise of this widespread impression regarding the crop of 1899, we requested Mr. David Horn, Chief Grain Inspector of Winnipeg, to make a collection of Manitoba wheats, taking the samples direct from the car, and forwarding them to us for examination. Accordingly, we received in March 9 samples. Mr. Horn writes: 'They are taken from cars passing here (Winnipeg) and sent in self-sealing jars. The wheats have never been brought into the heat. They are ticketed with the name of the station from which the wheats were shipped.'

The wheats on arrival were immediately ground and submitted to careful analysis. The moisture results are given as follows:—

Moisture in Wheats from Manitoba.

Station from which car was shipped.	1899 Crop. Percentage of moisture.
Grenfell	12·44
Broadview	12·63
Wapella	12·14
Glen Ewan	12·57
Hamiota	12·60
Whitewood	12·25
Indian Head	12·29
Winkler	10·25
Alexander	11·55

These percentages are by no means excessive, though slightly higher than those obtained on the Canadian wheats exhibited at the World's Columbian Exposition, Chicago, 1893, which were as follows:—

Average Percentage of Moisture.

Province	Number of Samples.		Percentage of Moisture.
Ontario	26		11·75
Manitoba	9		11·98
North-west Territories	9		11·55
British Columbia	5		11·48
Total	49	Average.	11·69

The difference between these results and those of 1899 crop may be partly due to season, but we think in all probability it is mainly caused by the drying out of the wheats before examination at Chicago; much of the grain exhibited there had been harvested 12 to 14 months when analysed. But be that as it may, we cannot regard the quantity of moisture in the wheat of the 1899 crop as at all excessive or abnormal, nor such as to cause any alarm in respect to the keeping qualities of the wheat or that of the flour produced from them.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES.

WHALE-OIL SOAP.

The efficiency of a wash or spray made from whale oil soap, as a means of destroying many soft-bodied insects, has long been known; during the past few years, however, this insecticide has received special and increasing attention from fruit growers. It is now advocated and largely used for San José scale, Oyster-shell Bark-louse, plant lice, &c., and information regarding the preparation and application of this remedy will be found in the present report of the Entomologist.

The term whale-oil in this connection appears to be synonymous with fish-oil; indeed, according to some authorities, practically all the brands of 'whale-oil' soap upon the market are made from fish oil. The character of the oil used is said to affect the insecticidal power of the soap; and some suppose it is the whale oil that imparts the peculiar virtue to this wash.

It is considered essential for the efficient action of this soap that it should be made with potash and not soda. Potash makes 'soft' soaps, which are viscous or semi-fluid; soda gives 'hard' and solid soaps. It is probable that potash soaps make the better and more adhesive wash when a hard water has to be used, but whatever may be the cause for the preferment, entomologists are of one mind in considering that potash soaps only should be used.

At the request of the Entomologist (Dr. Fletcher), we have examined several brands, the samples Nos. 1 to 6, inclusive, being received through the kindness of Mr. Geo. E. Fisher, Freeman, Ont. In the following table the percentages of water and potash are given. From these data the comparative value of the soaps may be deducted; those containing the smaller percentage of water and larger percentage of potash obviously being the better:—

ANALYSES OF SOFT SOAPS.

Number.	Marks.	Date Received, 1900.	Water. — Per cent.	Potash. — Per cent.
1	Owens whale-oil soap	May 18th	45·91	5·31
2	Home made soft soap	" 18th	66·48	6·17
3	Toronto Peerless soft oil soap	" 18th	41·51	8·78
4	Toronto whale-oil soap	" 18th	48·94	6·65
5	Hamilton vegetable oil soap	" 18th	73·82	1·47
6	London soap	" 18th	56·49	5·62
7	J. J. Ward, Consecon	April 17th	21·04	·054

In speaking of the composition of soft soaps, Allen, in his 'Commercial Organic Analysis,' Vol. II., Pt. I., p. 300, says: 'But few complete analyses of soft soaps have been published, but the proportion of water in samples of good quality is usually between 35 and 45 per cent, whilst the anhydrous oxide (potash) varies from 8·8 to 11·2 per cent.' Leaving out of consideration No. 7, which is a soda soap, it will be seen that the majority of the samples examined are below the standard here given.

'Can the whale-oil soap used in spraying for San José scale benefit the tree in any way other than as an insecticide?' This is a question frequently asked of us. Many orchardists affirm that there is a marked effect upon the vigour of the tree, as shown by the colour of the foliage and the improved appearance of the fruit, that can scarcely be attributed to the insecticidal properties of the soap. We offer the following as an answer to the foregoing question and as a probable explanation of the statement just cited:—

Whale-oil soap of good quality will contain from 9 to 12 per cent of potash. This element, as is well known, is an important and valuable constituent of plant food,

and especially so for fruit trees. It invigorates their growth and tends to the production of fruit with high flavour and good appearance.

It is not at all probable that there is any absorption of the potash from the soap spray through the bark or leaves, as many suppose ; the potash, in common with other mineral foods, must be absorbed from the soil through the roots. If the potash in the soap is to act as a food for the tree, it must follow the same course. It is not difficult to understand how this may readily take place, for sooner or later—probably within two or three weeks of spraying—the rains have washed off the soap, and it has been received and absorbed by the soil in the immediate neighbourhood of the roots. There it is gradually converted into assimilable compounds which can feed the tree.

We may now ask if there is sufficient potash in the amount of soap solution sprayed on the tree to make its value as a fertilizer worth considering. In making the solution for the San José scale, 2 pounds of soap are used per gallon, and probably 2 gallons will be required for a well-grown, mature tree. A simple calculation, on the basis of 10 per cent of potash in the soap and 35 trees to the acre, will show that the soil of each acre of orchard so sprayed receives 14 pounds of actual potash, that may subsequently be set free as plant food. This, though not a heavy application, would, in my opinion, be quite sufficient on many soils to produce a marked improvement. The usual dressing of the fertilizer muriate of potash is 100 pounds per acre, equivalent to an application of 50 pounds of actual potash. Each spraying with whale-oil soap, therefore, it is seen, furnishes an amount of potash somewhat greater than one-fourth of that supplied when using the above-named fertilizer in ordinary dressings.

ARBORINE.

Glen's Arborine is the name given to a much-advertised material for which is claimed very remarkable qualities as an insecticide, as well as the power of protection of fruit trees against mice and other vermin. During the past season numerous requests have been received for information regarding its nature and composition. Thus, in August last the editor of the *Canadian Horticulturist* writes: 'Members of the Ontario Fruit-growers' Association are continually making inquiries as to the nature of Arborine. If you could examine this insecticide, the information would prove of interest to many orchardists.' We, accordingly, procured an unopened 1-pound canister, which bears the following statement :—'A guaranteed protection to fruit and ornamental trees from rabbits, sheep, mice, borers, San José scale and insects. *Directions:* Mix the contents of this can in 1 quart of sweet milk, stir until all is dissolved. Apply with a clean paint brush immediately after mixing, or before milk sours. Price, $2.'

Arborine is a fine powder having the appearance of a yellowish ochre, possessing a peculiar odour not unlike onions, and which, on identification, proved to be that of asafœtida. Under the microscope, many small yellow particles were observed, which, on testing, gave all the reactions for sulphur. A qualitative analysis showed it to consist essentially of ochre, sulphur and asafœtida. The results of a quantitative examination afforded the following data :—

	Per cent.
Moisture	·86
Sulphur	38·73
Oxide of iron and alumina	23·87
Mineral matter, insoluble in acid	22·44
Sulphate of lime	·88

The sum total of these percentages, taken from 100, leaves in the neighbourhood of 13 per cent to be accounted for. This we believe to be chiefly asafœtida, for extraction of the Arborine with carbon bisulphide not only takes out the sulphur above recorded, but also about 6 per cent of a resinous substance having all the char-

acteristics of asafœtida. Experiments show that from 10 to 25 per cent of asafœtida, according to the quality of the substance, is soluble in carbon bisulphide. I think we are, therefore, justified in supposing that the difference already referred to is largely due to the presence of this gum-resin, and that Arborine is essentially a mixture of ochre, sulphur and asafœtida.

Regarding its efficiency, we have no data to bring forward. Most probably, it acts as an excellent deterrent against the attacks of certain forms of life, protecting the tree by virtue of its sulphur, and possibly to a still greater extent by reason of the peculiarly unpleasant and penetrating odour that it emanates, due to its asafœtida. We can only remark that the price asked for this material seems to be greatly in advance of the cost of its components.

WEED KILLING COMPOUNDS.

HARVESTA CHEMICAL COMPOUND—A WEED DESTROYER.

This is a brownish coloured fluid, made in New Orleans, La., and sold for the purpose of destroying weeds in gravel paths. It was analysed at Dr. Fletcher's request.

The mixture was neither caustic nor alkaline, and on analysis was found to contain arsenite of soda and common salt. These together amounted to 4·0 per cent, or 6·4 ounces per gallon ; the common salt being 1·69 per cent, or 2·7 ounces per gallon.

No doubt this is an effective weed exterminator, since both its constituents have long been known and used for this purpose. It is, perhaps, scarcely necessary to point out that such preparations should only be used on paths or where it is desired to kill all vegetation.

WEED KILLING COMPOUNDS.

For those who desire to prepare for themselves a weed-killing fluid we furnish the following recipes. The fluids are cheap and easily prepared, and have been used with good effect :—

1.—To boiling water add common salt at the rate of one pound to one gallon. As soon as the salt is dissolved, and the liquid is still hot, apply it by means of a watering can.

2.—White arsenic	pounds	1
Washing soda	"	2
Water	gallons	3

Boil and dilute with from two to three times its volume of water. Apply while still warm in fine weather. This solution is highly poisonous.

3.—Blue vitriol (bluestone)	pounds	2
Water (hot)	gallons	6

Put the bluestone in a crock or wooden tub and pour on the water. Use while still hot.

4.—Sulphuric acid in the proportion of one part of acid to 1,000 of water has also been effectively used where the soil does not contain any appreciable amount of carbonate of lime. If there is effervescence when the acid solution is sprinkled on the path (showing the presence of carbonate) this preparation will be of no value.

5.—Salt cake, or acid sulphate of soda, a by-product in the manufacture of muriatic acid, applied in solution (one pound to one gallon) is very effective.

With respect to the use of any of the foregoing, it may be pointed out that thorough applications, especially at the beginning of the season, are to be advised, rather than lighter and more frequent doses. All these chemicals will do serious injury to soils intended for cultivation.

THE COLE BUTTER-MAKING PROCESS.

This method or process consists simply of blowing air (previously warmed by water to a temperature between 70° F. and 80° F.) through the well-ripened cream, contained in a cylindrical glass vessel, 21 inches high and 13 inches in diameter.

The apparatus consisted of a double-acting air pump (worked by a belt from the shafting) which forced air to the bottom of a copper vessel, 13 inches in diameter and 16 inches high, containing water at a temperature of 85° F. to 90° F. After passing through the water, the air was conducted from the copper vessel by a piece of block-tin tubing terminating in a coil resting on the bottom of the churn. The air escaped from the open end of the coil, as well as from small holes pierced therein.

The agitation or churning is accomplished simply by the air bubbling through the cream.

To ascertain what foundation there might be for the claim of the inventor or promoter that 20 to 30 per cent more butter could be obtained by this method than by any other, and to learn what merits, if any, this process might possess over that ordinarily in use, two series of experiments were made last November. The first had for its object more especially the tracing of the butter-fat from the beginning to the finish of the process. The plan adopted and the analytical methods used were such as to yield data of an exact character, and consequently would show any loss or gain in butter-fat during the ripening of the cream in the period previous to churning or during that operation. The second investigation was undertaken with a view of obtaining data regarding the economy of this process as compared with that in general use. All the work was most carefully done, and, as already stated, only the most accurate and approved chemical methods were employed for the analysis of the cream, buttermilk and butter. Final results only will be here recorded, in order that this report may be presented in as concise a form as possible.

Experiment 'A.'—On November 22, 1899, a quantity of cream was set aside in the usual shot-gun can to ripen in the dairy, the temperature throughout the ripening period being maintained at about 70° F. As directed by Mr. Cole, the cream was stirred at intervals until the 27th, when the churning was made. The data respecting the weight and composition of the cream, and the total amount of fat present on November 22, are as follows :—

Weight of cream	pounds	13·9
Fat in cream	percentage	28·54
Fat in cream	pounds	3·96

On November 27, immediately before churning, the cream was again weighed and analysed, and afforded the following data :—

Weight of cream	pounds	13·81
Fat in cream	percentage	28·33
Fat in cream	pounds	3·91

Comparing these with the foregoing figures, it will be seen that there was no increase in the amount of butter-fat during the ripening of the cream.

The churning (November 27) was made in twenty minutes, the directions furnished by the promoter being followed as closely as possible. After the butter had been carefully collected, the buttermilk and subsequent wash-waters were mixed, weighed and analysed :—

Weight of buttermilk	pounds	160
Fat in buttermilk	percentage	0·124
Fat in buttermilk	pounds	0·198

From the above figures and those preceding, it can be shown by calculation that 5·07 per cent of the total fat supplied in the cream appeared in the buttermilk.

The data respecting the butter obtained may now be cited :—

Weight of butter....	pounds	4·5
Fat in butter....	percentage	82·15
Fat in butter....	pounds	3·696

The following statement summarizes the results : —

Fat in cream as churned....		pounds	3·91
" buttermilk....	pounds	0·198	
" butter....	"	3·696	
	pounds	3·894	

It is thus seen that practically all the fat present in the cream immediately prior to churning was accounted for, and, further, that there was no increase in its amount —due either to fatty degeneration of the albuminoids or absorption of atmospheric oxygen, as claimed by Mr. Cole—either prior to churning or during the churning process.

Experiment 'B.'—November 28, 1899 : A quantity of cream having been ripened in accordance with the afore-mentioned directions, was thoroughly mixed (so as to be uniform in quality throughout), and divided ; half was churned by the Cole process, and half was churned by the farm dairyman in the churn ordinarily used in our dairy. The data are tabulated as follows :—

By Cole Process—

Weight of cream....	pounds	27	
" butter obtained....	pounds	8·125	
Fat in butter....	percentage	83·48	
Fat in butter....		pounds	6·912
Buttermilk and washings....	pounds	130	
Fat in buttermilk....	percentage	0·26	
Fat in buttermilk....		pounds	0·338
Total weight of fat....		pounds	7·25

By Ordinary Method—

Weight of cream	pounds	27	
" butter obtained....	"	8·656	
Fat in butter....	percentage	84·25	
Fat in butter....		pounds	7·29
Buttermilk and washings....	pounds	20	
Fat in buttermilk....	percentage	0·2	
Fat in buttermilk....		pounds	0·04
Total weight of fat....		pounds	7·33

Percentage of the total fat supplied in cream, as found in the buttermilk by Cole process....	4·61
Percentage of the total fat supplied in cream, as found in the buttermilk by ordinary method....	0·54

It is thus evident that we were unable to obtain as much butter by the Cole as by the ordinary method, and, that there is a much greater loss of fat in the buttermilk by the former than by the latter process.

The whole process, from first to last, was carefully watched by Mr. Grisdale, the Agriculturist, who begs to submit the following statement respecting the method and the quality of the butter produced :—

'A number of carefully carried out trials of the Cole butter-making process have been made in the dairy of the Experimental Farm under my direct supervision, and as a result I have no hesitation in saying that in point of efficiency or economy this newly introduced method has nothing to recommend it. It is quite apparent that there is a very much larger loss of butter-fat in the buttermilk than by the ordinary methods.

'Regarding the quality of the butter, we have to state that while it was not unpleasant to taste when first churned, it soon developed a strong flavour, which became more and more marked until at the end of two weeks it was quite unpalatable, though it could not be classed as rancid.

'In texture, it is very fine-grained with a slight greasiness apparent, which would detract much from its commercial value. The claim advanced by Mr. Cole, that a uniform and constant flavour would be ensured by his process, is not sustained; butters made at short intervals—say, of a few days or a week—differed very much in flavour from one another, and we are of the opinion that the ripeness of the cream influences the flavour as much when churned by this method as when handled in the regular way.'

Being desirous of furnishing our readers and correspondents with the opinions of those who were competent to speak in the matter of the reputed increases of fat during the ripening or churning of cream—opinions which we felt sure would support the position we had taken, that there was no appreciable increase—we sent the following letter to Dr. S. M. Babcock, Chemist, Experiment Station, Madison, Wis., and to Dr. L. L. VanSlyke, Chemist, Experiment Station, Geneva, N.Y., both dairy chemists of wide repute :—

'Have you in the course of your work ever made any investigation regarding the reputed formation of butter-fat from albuminoids during the ripening of cream or cheese ? If you can furnish me with any data, or refer me to any recent work on this point, I shall feel greatly obliged, as we have at present under examination a butter-making process, the inventor of which claims an increase in the amount of fat from this cause.'

Their replies are as follows :—

'Yours of November 23 in relation to the formation of fat from albuminoids in the ripening of cream or cheese, is duly received.

'I know of no recent investigation on this point, but am certain that the general opinion among investigators is that there is practically no change of fat through the fatty degeneration of albuminoids in either cream or cheese.

'(Sgnd.) S. M. BABCOCK.'

'In reply to your inquiry of recent date, I would say that we have paid special attention to the possible formation of fat from albuminoids during the ripening of cheese and we have never found any evidence whatever that such change takes place.

'(Sgnd.) L. L. VANSLYKE.'

From time to time farmers and dairymen have brought before them by interested, if not dishonest, persons, methods, recipes, or materials the employment of which it is claimed will effect a larger yield of butter from a given weight of cream than can be obtained by the ordinary process. Several of these methods have been examined in

the laboratories of the Experimental Farms, with the result, as might be expected, of proving them worthless and fraudulent. In most instances there is a direct failure to obtain a larger yield of butter—and in those in which a somewhat greater weight of product results, the increase has been shown to be due to the presence of excess of water or curd, or both, rendering the article one which the law considers adulterated. Further, such so-called butter, even when freshly made, is far inferior to ordinary good butter, and having exceedingly poor keeping qualities, soon becomes altogether unmarketable.

We know as a scientific fact that the ordinary methods in use in our dairies and creameries, if rightly conducted, practically abstract all the butter-fat, and we also know that there are no means for increasing the butter-fat in cream by the addition of foreign materials, by absorption of oxygen, or by conversion of the albuminoids, as claimed by many of those having methods for sale. Any addition to the weight of butter by artificial means must come from the admixture of curd or water, or both—and such, as we have already stated, do not yield either a legal or marketable butter, but a product which will bring trouble and loss to the maker.

It is all important to the dairying interests of the Dominion, more especially as we are now building up a large and valuable export trade in butter with Great Britain, that we should have nothing to do with any of the methods here alluded to.

WATER FROM FARM HOMESTEADS.

Of the 75 samples of water received during the past year, 41 have been submitted to complete analysis ; their data are recorded in the subjoined table. The remaining samples were not examined either owing to the quantity of water being inadequate, dirty bottles, or old and used corks having been employed. In order to avoid disappointment and unnecessary expense, farmers and dairymen wishing to avail themselves of the privilege extended in this matter, should first write for instructions on the collection and shipment of samples, furnished on application, so that the water when received will be in such a condition that a reliable analysis may be made.

The analysis of mineral waters and examination of waters for medicinal purposes is not undertaken ; it is only samples from farmers' wells and dairies that can be received, and these must be taken in accordance with the directions already referred to, and the express charges prepaid.

The waters comprise 21 samples from Ontario (of which 10 were reported polluted, 5 suspicious and probably dangerous, and 6 as free from contamination) ; 5 from Manitoba ; 4 from the North-west Territories ; 3 from British Columbia ; 3 from Quebec ; 3 from New Brunswick ; 1 from Nova Scotia.

Much has been said in past reports of this Division on the danger to the health of the farmer and his family in using water contaminated by organic filth, and also as to the effect of such water upon the thriftiness and health of his live stock. We have also pointed out how essential pure water is for creameries and cheese factories, for without it first-class products cannot be obtained. The following paragraphs, taken from a former report of this Division, however, may be worthy of repetition, as showing how well water may become contaminated:—

'The most common cause of well pollution has been the sinking of the well in the barn-yard or under one of the farm buildings. We object to this practice on principle and hold that only under the most exceptional circumstances can it be followed with impunity. From our experience, it would appear that in the majority of instances it is only a matter of time before such wells act as cess pits. Unless most careful provision is made to prevent the liquid manure from soaking into the ground, it sooner or later, according to the nature of the soil, finds its way into the well. If this be so, it behooves all farmers and dairymen to locate their well at a safe distance from such infecting sources.

ANALYSIS OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1899.				
1	St. Marys, Ont	J. S.	Dec. 7	None.	·12	·033	2·2
2	Urquhart, Alta	H. R. F.	" 14	·024	·063	·013	18·2
3	Hanover, Ont	J. J. W., No. 1	" 14	·138	·09	2·620	6·4
4	"	J. J. W., No. 2	" 14	·175	·105	3·639	10·2
5	Wheatland, Man	J. A. N	" 26	·10	·31	1·087	178·0
			1900.				
6	McKenzie, Man	W. W	Jan. 4	None.	·69	·115	58·0
7	Sonya, Ont	J. W	" 11	Traces.	·20	2·784	78·0
8	Granby, Que	W. K. per Dr. M. C. B.	Feb. 6	·195	·065	·827	1·30
9	Chilliwack, B.C	A. E. W	Mar. 7	None.	·160	Traces.	·60
10	Fulton, Ont	T. T., No. 1	" 15	·137	·387	·630	·90
11	"	T. T., No. 2	" 15	·012	·287	·936	3·50
12	Barrie, Ont	F. McT	" 24	·045	·160	2·994	7·50
13	Melita, Man	J. W	" 29	·512	·31	·336	15·0
14	Auburn, Ont	W. D	April 19	·025	·12	2·928	6·2
15	Grenfell, N.W.T	F. E. D	May 2	·070	·29	2·758	33·5
16	Morris, Man	J. T. B	" 19	3·33	·23	None.	4000·0
17	Calgary, N.W.T	P. T. B	" 23	1·11	·08	None.	6·8
18	Chatham, N.B	D. P. Co., No. 1	" 23	None.	·102	·1317	·6
19	"	D. P. Co., No. 2	" 23	None.	·155	·0263	·4
20	Billing's Bridge, Ont	N. G	July 7	·23	·29	None.	14·0
21	Calgary, N.W.T	T. S. C. L. Well	" 30	None.	·095	2·142	3·5
22	Tecumseh, Ont	Wm. McG	Aug. 1	17·85	·05	1·174	11108·3
23	Rifle Range, Ottawa, Ont	Lt. C. T., No. 1	" 13	·029	·242	·668	4·0
24	" "	" No. 2	" 13	·016	·165	4·623	10·4
25	" "	" No. 3	" 13	·016	·135	2·935	16·3
26	Pickering, Ont	G. P.	" 20	·08	2·61	8·699	45·6
27	North Salt Spring, B.C	F. L	Sept. 15	·69	·265	·1317	12·0
28	Westport, N.S	E. C. B	Oct. 1	·017	·300	·0173	48·0
29	Shellmouth, Man	W. L. W	" 11	·156	·218	13·943	21·5
30	Sussex, N.B	W. W. H	" 19	·26	1·466	·0724	8·6
31	Miller's Corner, Ont	H. W. G	Nov. 8	3·85	·33	1·30	90·0
32	Buena Vista, Rockliffe	E. H. M	" 9	1·51	·647	·381	5·6
33	St. Catherines, Ont	F. B	" 12	·124	·196	1·230	291·0
34	Lytton, B.C	A. L	" 12	·01	·04	·019	Sl. trace
35	Anticosti Island, Que	Dr. D. J. S	" 12	·042	·12	1·356	23·0
36	" "	"	" 12	1·05	·104	·317	113·0
37	Deer Park, Ont	E. Q	" 16	·035	·158	5·368	10·8
38	Tilsonburg, Ont	E. D. T., No. 1	" 16	·014	·086	6·987	4·8
39	"	" No. 2	" 16	·016	·120	8·703	8·0
40	"	" No. 3	" 16	·08	·277	20·282	38·0
41	"	" No. 4	" 16	·008	·117	17·082	18·0

WELL WATERS, 1900.

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
260·0	230·0	30·0	Slight traces........	Free from pollution, a wholesome water.
342·0	282·0	60·0	None...............	Free from all drainage matter of a pernicious character.
298·0	224·0	74·0	Heavy traces.......	Polluted, an unsafe water.
392·0	282·0	110·0	Traces..............	" a decidedly dangerous water.
2458·4	1748·8	709·6	....	Highly charged with saline matter.
7978·0	6228·0	1750·0	Traces......	Highly charged with saline matter.
660·0	545·0	115·0	....	Contaminated; use attended with danger.
25·2	14·0	11·2	Traces....	Water contains drainage matter.
117·6	100·0	17·6	"	A first class water; free from all pollution.
43·0	17·0	26·0	Traces..............	A doubtful water.
158·5	104·5	54·0	"	Not first class, possibly polluted.
264·0	192·0	72·0	Heavy traces..... .	Indication of pollution; very doubtful purity.
1879·6	1327·2	552·4	Traces....	Highly saline and unpalatable.
330·0	220·0	110·0	None...............	Somewhat suspicious, indication of previous contamination.
3501·0	3041·0	460·0	....	Strongly saline and probably purgative.
8256·0	6394·0	1862·0	Traces..............	Very strongly saline, unfit for use unless distilled.
1201·6	1052·8	148·8	None...............	Probably free from organic pollution, but very saline.
40·0	22·4	11·6	"	Free from pollution and wholesome.
40·0	28·0	12·0	Very slight traces...	" "
608·0	428·0	180·0	Heavy traces........	Highly suspicious; of very doubtful purity.
374·0	226·0	148·0	"	" " "
22751·2	....	....	....	Saline water.
64·0	32·0	32·0	Traces..............	Unpolluted and wholesome.
126·4	64·4	62·0	Slight traces........	Good drinking water, free from contamination.
190·0	120·0	70·0	Traces.....	Free from pollution.
608·0	342·8	265·2	Heavy traces	Seriously contaminated.
271·2	189·6	81·6	"	Very suspicious, drainage matter indicated.
278·4	205·6	72·8	Traces.......	Indication of pollution, somewhat suspicious.
484·4	318·8	165·6	Very heavy traces...	Very seriously polluted with drainage matter.
104·0	51·2	51·8	" " ...	Dangerously contaminated.
564·8	347·2	217·6	Heavy traces	Most seriously polluted.
368·0	251·0	97·0	Traces..............	Dangerously polluted.
2527·6	2240·4	287·2	None...............	Probably containing drainage matter, dangerous water.
185·2	126·8	58·4	"	Excellent water, free from injurious matter.
257·6	138·8	118·8	Traces..............	A water of suspicious quality.
487·2	413·2	74·0	Slight traces........	Water of doubtful purity.
388·0	265·6	122·4	"	Dangerously contaminated with organic matter.
278·4	164·0	114·4	Very slight traces...	Probably a wholesome water.
418·4	221·2	197·2	Heavy traces	Very seriously polluted.
576·0	363·2	212·8	Very heavy traces...	Dangerously contaminated.
451·2	274·4	176·8	Slight traces........	Bad water, containing a considerable amount of drainage matter.

'The greatest care should be taken at cheese factories and creameries that the waste water does not find its way into the water supply, and to insure this thorough and efficient drainage is necessary.

'Further, there is much room for improvement in keeping the buildings and barn-yards clean. If greater care had been exercised in this matter, many wells which are reeking with filth would to-day be free from impurity. Apart from the question that a dirty barn-yard means a loss of valuable plant food—a question well worthy of closer consideration—there remains the equally important fact that such is usually a menace to health through contamination of the well water.'

We are pleased to note that driven and bored wells, supplied with windmill power, are becoming more and more common. Such wells may be situated at a considerable distance from the farm buildings, and thus obtain their water from a source about which there can be no reasonable doubt as to purity.

Several of the samples received from the North-west Territories and Manitoba were found to be strongly saline, and for this reason non-potable. The chief constituents of this soluble mineral matter are common salt (sodium chloride), Glauber's salt (sodium sulphate), and Epsom salts (magnesium sulphate). A part of the latter might be precipitated by the judicious addition of lime water, but such a plan of purification is only effective when other salts—sulphate and chloride of sodium are absent. In the majority of instances, distillation must be resorted to if a wholesome, potable water is to be obtained. Small household stills, cheap and easy of management, and which can be used on the kitchen stove, are now procurable, and are to be strongly recommended to farmers in alkali districts for furnishing a supply of good drinking water, free from saline matter.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST.

(JAMES FLETCHER, LL.D., F.L.S., F.R.S.C.)

1900.

OTTAWA, December 29, 1900.

Dr. WM. SAUNDERS,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you herewith a report on some of the more important subjects which have been brought officially before the Division of Entomology and Botany during the past season. Owing to the large increase in correspondence and the numerous species of insects and plants inquired about, it has been somewhat difficult to decide what subjects could be most usefully treated of in the present report. I have prepared articles upon those subjects concerning which I thought information would be of most service to the farmers, fruit-growers and gardeners of Canada.

Since the fitting up of a new room for the exhibition of specimens, many visitors to the Central Experimental Farm have availed themselves of the opportunity of consulting the collections which are now being gradually arranged and put into shape for reference. Many valuable additions have been made during the year to both the entomological and botanical collections.

Considerable progress has been made in the studies of the life-histories of our native insects, both noxious and beneficial, and a fine collection illustrating all stages of their development is being gradually accumulated. During the past year many specimens of inflated caterpillars have been prepared by Mr. Arthur Gibson, assistant in the Division, and are much admired by visitors.

The experiments in growing grasses and other fodder plants have been continued and are of great interest.

The Apiary, as heretofore, has been looked after by Mr. John Fixter, the farm foreman, and his report on that branch of the division work is printed at page 243.

Correspondence.—From November 30, 1899, to November 30, 1900, the number of letters, exclusive of circulars, received by the Division, was 3,017, and the number of letters despatched was 2,847.

Meetings Attended.—Meetings of farmers, dairymen, fruit-growers, &c., have been attended whenever official duties would allow of my absence from Ottawa. Addresses were delivered at the following places : Granby, Que., February 20 and 21 ; Cowansville, Que., March 14 and 15 ; St. Catharines, Ont., March 20 ; Danville, Que.,

September 5 ; Niagara Falls, Ont., December 5 and 7 ; London, Ont., November 13, 14 and 15, attending the annual meeting of the Entomological Society of Ontario. Meetings have also been attended and addresses delivered before the Toronto and Montreal branches of the Entomological Society, and also before the Toronto and Ottawa Normal School students on nature study. In June last on account of reports received from Manitoba of serious depredations on crops by locusts, and at the request of the Provincial Minister of Agriculture, I was instructed by the Honourable the Minister of Agriculture to proceed to Manitoba and investigate the matter. Accordingly, on June 21 I left Ottawa, and, having joined the Chief Clerk of the provincial department at Winnipeg, visited some of the worst affected districts. This matter is reported upon later on.

In response to a request to the Minister from the government of the North-west Territories, I then went on to Regina and joined the Hon. G. H. V. Bulyea and, in company with him and Mr. Angus Mackay, the Superintendent of the Experimental Farm for the North-west Territories, went to the Prince Albert district and held a series of farmers' meetings. Addresses were delivered upon agricultural subjects with special reference to the control and eradication of noxious weeds. These meetings were very successful, and the country traversed—a circuit of about 200 miles through a country of great fertility—was of extreme interest. Leaving Prince Albert on July 7, where the first meeting was held the previous day, we drove east and south and held meetings at Colleston, July 7, Melfort, July 9, Kinistino and Harperview, July 10, St. Louis, July 11, Lindsay and Willoughby, July 12, Rosthern, July 13, and back to Duck Lake on the railway on July 13. A supplementary and very largely attended meeting was held at the request of Mr. Wm. Trant, at Lumsden, twenty miles from Regina. Several excellent farms were examined en route and much valuable information as to the nature of the country and its suitability for various crops was acquired, which will be of much use to me in the future.

Acknowledgments.—My special thanks are gratefully tendered to the following for frequent and valuable assistance : to Prof. John Macoun, of Ottawa ; Prof. J. B. Smith, of New Brunswick, New Jersey ; Dr. L. O. Howard and Messrs. B. T. Galloway and A. F. Woods, of Washington ; Prof. F. M. Webster, of Ohio, and Mr. G. B. King, of Lawrence, Mass., for identification of specimens, and also to Prof. C. C. James, Deputy Minister of Agriculture for Ontario ; Mr. J. R. Anderson, Deputy Minister of Agriculture for British Columbia, and Mr. Hugh McKellar, Chief Clerk of the Department of Agriculture for Manitoba, for prompt notification of outbreaks of injurious insects. To Mr. R. M. Palmer, Inspector of Fruit Pests for British Columbia, and the Rev. Father Burke, of Alberton, P.E.I., I am indebted for reliable reports on insect injuries and the condition of the crops in their respective provinces, all of which have been of great service to me in making the work of the division under my charge useful to the farmers of Canada.

In conclusion I have much pleasure in testifying to the assiduity and excellence of the work performed by my assistants, Mr. J. A. Guignard, B.A., and Mr. Arthur Gibson, in office hours or afterwards whenever required.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

INSECT PESTS.

THE HESSIAN FLY
(Cecidomyia destructor, Say).

A serious outbreak of the Hessian Fly in the fall wheat fields of western Ontario during the past season has to be recorded. There was some appearance of the summer brood in the same districts, but only a few references were made to the insect, until it was found that the new crop of fall wheat was infested to a degree which has seldom been seen in Canada for many years. The district where the greatest harm was done, was in the area lying to the west of Lake Ontario, and north of Lake Erie.

Fig. 1.—The Hessian Fly—enlarged and natural size.

Prof. Lochhead, of the Guelph, Ontario, Agricultural College, writes as follows :—

'Guelph, December 22.—The Hessian Fly is very general in Essex, Kent, Elgin, Norfolk, Haldimand, Lincoln and Middlesex ; it is reported from various parts of Welland, Lambton, Huron, Oxford and Brant. Occasional mention is made of it in Perth and Simcoe. Practically none is reported from Bruce, Grey, Wellington, Waterloo and Dufferin. The eastern half of the province is practically free from the Hessian Fly. (The above information was obtained chiefly through the reports of the Bureau of Industries.) Professor Pettit, of the Michigan Agricultural College, writes me, December 1, that this year all early sown wheat, and, in fact, all wheat sown before October 1, is infested, some of it badly. This is the case over a great part of the state. In ordinary years the third week in September is late enough to sow wheat to escape the fly, and we should not, I think, make our deductions from two such unusual years as the last were.'

'Brantford (Brant Co.), Ont., August 3.—The Hessian Fly has been bad in this neighbourhood this season. How late should I sow my wheat in order to escape the fly altogether ? Would there be any use in sowing as small a plot as half an acre on a fifty-acre farm, to act as a trap, if no neighbour sowed any wheat extra early ? What would be the best date to sow ?'—T. F. HOWELL.

'Waterford (Norfolk Co.), Ont., Nov. 7.—The Hessian Fly seemed to injure the sample of wheat this year by preventing some of the grain from maturing. Late sown fall wheat seems rather free this autumn, but that sown early seems to be in some cases so badly infested that farmers are talking of ploughing it under.'

'Waterford (Norfolk Co.), Ont., November 29.—I have found two fields quite close together which are affected by the Hessian Fly. The grower, Mr. James Clark, states that both fields were sown from 15th to 23rd September. In one, a field of Clawson wheat, I believe that 80 per cent of the plants contain Hessian Fly puparia, and in the other field, of Democrat wheat, about 30 per cent. You will notice from the specimens sent that the Clawson plants affected show the upper and earlier sprout generally killed, but there is an uninjured sprout growing up from the original seed. The Democrat variety, on the other hand, shows that the insect has not injured the original sprout to so great an extent, and, consequently, this second sprout from the seed has not made its appearance in so many cases as in the Clawson. With respect

to the appearance of the two fields, the Democrat looks quite green, healthy, and apparently uninjured, but the Clawson appears wilted and not nearly so green. The difference in favour of the less injured field was very noticeable. About November 8, I found no larvæ in the fields; all had changed to flax-seeds. This fall has been very remarkably free from early frost.'—N. H. Cowdry.

'Belmont (Middlesex Co.), Ont., December 4.—Fall wheat has been considerably injured in this section by Hessian Fly. Feeble wheat on poorly-prepared ground is very badly injured, portions of it being entirely killed out. Most of the wheat turned yellow, more or less, during October, owing, I think, partly to the unseasonably warm weather, causing rust to develope. Since receiving your letter, I have carefully examined many fields of wheat, and am convinced that all the damage was not done by Hessian Fly. Wheat that has a bulky vigorous growth promises to give a fair crop next year, as the stools have many comparatively sound and healthy shoots left ; after feeding the fly, they had a lot of vitality and substance remaining, but badly nourished wheat had little or nothing left after the flies had fed on them, and they are now dead, or nearly so. The summer brood did considerable damage here, both to wheat and barley. I am satisfied that the fly cut me short 100 bushels on 27 acres. Heavy crops of wheat were hardly touched by the fly ; but, where the wheat was winter-killed, or otherwise weakened and thin, it did a lot of damage Many farmers held off their sowing this year to escape the fly, but this, I think, is a mistake. Late wheat will be weak and more liable to winter-kill, and for this reason will fall a more easy prey to the summer brood next year. I believe that if wheat is sown at the right time on rich and well-prepared land, it will get a vigorous, bulky growth in the fall, and will thus be able to withstand the attacks of both broods of the fly.'—H. Pettit.

'Ferguson (Middlesex Co.), Ont., October 30.—Since reading Dr. Saunders's article in the Entomological Society of Ontario report for 1882, I have found that the suggestions there made concerning treatment for the Hessian Fly work very well. However, I have followed them again to the letter this year, working the land with the twin plough immediately after the crop was taken off, then ploughing after, and sowing from 17th to 24th September, and have now under wheat, ground that was previously sown to clover, barley, oats, and a small piece of wheat. The result in all cases is the same, the plants are full of Hessian Fly in all stages, from the tiniest mite to the flax seed state. I have also found another insect, a sort of buff colour, with legs and a proboscis, with which it probes the plants, and any plants that I have seen attacked are doomed. The Hessian Fly is so numerous this year that I have counted as high as fifteen clustered in one stalk. Yesterday, my interest in this subject being aroused, I inspected many fields which had been sown on or about August 31 up to September 29, and I find them all thoroughly infested, and to such an extent that I think the most advisable course will be to plough them under and sow a spring crop. You could do agriculturists a signal service by collecting evidence of the extent or area covered by this pest, and by giving the results publicly in the press, describing the habits of the fly, and particularly how often reproduction takes place. By doing this, farmers would be in a position to judge of the advisability of leaving their fields, or of ploughing up and resowing with oats or some other spring crop. It would also give them an opportunity to provide seed, which is at a late date, like spring ploughing, for instance, both difficult to get and often dear.'—John C. Wallis.

'Binbrook (Wentworth Co.), Ont., December 4.—I mail you to-day two samples of fall wheat, one sown on September 10, and the other September 13. They are both of the same variety, Long Amber. This is a fair sample of the wheat in Wentworth county.'—E. J. Duffy.

The samples sent were found to be pretty badly infested with puparia of Hessian Fly. In the first parcel of 22 plants, 3 of them were crowded with flax seeds, but 19 were uninjured. In the second parcel, 12 were infested and 14 uninjured.

'Waterford (Norfolk Co.), Ont., December 3.—In the townships of Townsend and of Windham, the Hessian Fly will nearly ruin the whole wheat crop. My wheat is half dead now, but some of it has started up from the root again. I have counted as many as nine flax seeds on one stem. I sowed my wheat on September 19 and 20. I do not think there will be half a crop of wheat. Some farmers sowed earlier and some later, but their wheat is as bad as mine.'—WILLIAM SCHRAM.

Every plant sent with the above letter was heavily infested, and the roots were apparently quite dead, with no appearance of new shoots being thrown out, as in the case of the plants sent from the same place by Mr. Cowdry.

'Glencoe (Middlesex Co.), Ont., December 4.—The fall wheat is so badly killed that there is very little left. There will be hardly a field left by spring. I sowed my first wheat on September 14, and on the 18th I sowed another field. The field I sowed last is the worst I have, but it is a weak growing variety called Kansas Turkey Red. All the rest of my wheat is Dawson's. One of my neighbours sowed September 1; all is gone. Another sowed on October 1, and this is not affected so far as I can see, but it did not make much top. I was about 40 miles west from here, and I saw a great amount of the wheat affected. Some was not up which was sowed very late. I sowed a field for one of my neighbours on September 19 on a gravelly loam. There is not a single green leaf left in the field. I notice that there is a little more greenness on the heavy clay than on the loam, gravel or sand. We had no frost until very late this year.'—JAMES GLASGOW.

The samples sent by Mr. Glasgow were all badly attacked, and about equally, by the Hessian Fly (every specimen of which was in the flax-seed state) and by the Wheat-stem Maggot (*Meromyza americana*, Fitch), all in the larval state.

It will be seen from the above letters, which cover all the points brought forward in other letters, that there are two features about this year's attack by the Hessian Fly which are unusual. In the first place, the severity of the outbreak, accompanied by a remarkable number of puparia in each stem, and the late date at which the flies were active and laying their eggs this autumn, thus necessitating at least a delay of one week more beyond the usual date recommended for safety, viz., the third week in September, before it will be safe to sow fall wheat and have it free from the attack of this enemy. From correspondence and a personal investigation of the fields in the Niagara Peninsula made early in December, this year, it was apparent that late sowing was attended with very beneficial results. Owing to the open and mild autumn this year, it was possible to sow later than usual, and several fields sown in the beginning of October were much freer from attack than those which were sown at what was considered to be the proper time, namely, the end of August or the beginning of September.

For many years previous to 1899 the Hessian Fly has done very little harm in Canada to fall wheat, and as a result of a great many experiments which are being carried out every year by the members of the Ontario Experimental Union, and other progressive farmers, it had become well known that the best crops were reaped from fall wheat sown at or before September 1. This, therefore, had given rise to the opinion that the proper time to sow fall wheat was at or about the date mentioned. This, however, is only true in such seasons and localities as the Hessian Fly and Wheat-stem Maggot are not abundant; but in periods when these two serious enemies increase, as has been the case during the present season and last year, it will be found that the proper season to sow fall wheat and rye is subsequent to the time when the egg-laying females of the autumn broods of both of these insects have disappeared. For a year or two, at any rate, it will certainly pay farmers to acquaint themselves better with the life histories of these insects and the remedies which have been found successful in preventing the losses due to their attacks.

The life history and the remedies for the Hessian Fly have been frequently given in the reports of this Division, and were fully treated in last year's report, but it may be well here to again give a short synopsis of these.

Attack.—In autumn a few small whitish maggots, oval in shape, generally showing a green stripe in the centre, may be found in the root shoots of fall wheat. Later these harden and turn brown, when they resemble small flax seeds. During May and June of the following spring, the so-called Hessian Flies, small blackish midges, with smoky wings and about ⅛ inch long, appear and fly to the fields of growing wheat, where they lay minute reddish eggs, singly or in small clusters, on the upper sides of the leaves. The young maggots, after hatching, work their way down inside the sheaths of the leaves and feed at the bases of the joints. The presence of the puparia, or flax seeds, can usually be detected by the breaking down of the stem at the point where these occur, owing to the weakening of the stem by the attacks of the maggots. The flies from this summer brood appear in September and lay their eggs upon the leaves of the young fall wheat. This is called the autumn brood, and is the one which has done so much harm this year.

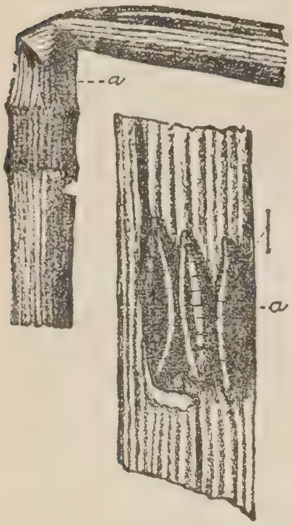


Fig. 2.—Hessian Fly; injured wheat-stem; three puparia enlarged.


Fig. 3.—Hessian Fly: puparia—natural size and enlarged.

Remedies.—1. Late Sowing.—The most important preventive remedy against injury by the Hessian Fly is the postponement of seeding until the end of September. By this means the appearance of the young plants above the ground is delayed until after the egg-laying flies of the second brood are dead. Where fall wheat has been sown in August, as is frequently done, the plants are well up and ready to receive the eggs of the flies when they emerge from the flax seeds of the summer brood. It is sometimes advised to feed off the green tops to a certain extent with sheep during the months of September and October, in which way it is claimed that many of the eggs are destroyed. I have never been able to prove that there is any advantage in this method other than giving a supply of good fodder at a time of the year when this is sometimes short. The chief objection to sowing so late as the end of September is that, as a rule, the plants have not time to make vigorous roots and tops so as to withstand the cold of severe winters. This, however, is seldom true, and in a great number of experiments, even at Ottawa, I have frequently found that good crops can be obtained from wheat sown much after the first of October, and while the Hessian Fly is abundant I believe that it is the very best policy for farmers to sow their fall wheat rather by the first of October than by the first of September, for although they may get a slightly smaller yield, it is better for them to be content with this and to be sure of it, than, in the effort to get a bigger crop, perhaps run the risk of losing half or even more from the attacks of the Hessian Fly. On this question of the proper time to sow fall wheat, the following from Prof. F. M. Webster, the State Entomologist of Ohio, who for a great many years has made a special study of the Hessian Fly, is of interest :—'I think the proper time for sowing fall wheat is late September. Early sown wheat will surely invite the attacks of the fly, and, while in years when this is not abundant the wheat may go into winter in better condition than that sown later, I believe that ordinarily this will not be the case. Your idea of choosing vigorous growing varieties and sowing late, on land prepared in the best possible manner is, to my mind, the right one. I think that in fall wheat the spring brood of Hessian Fly generally selects the younger tillers. I have observed in many cases that at harvest, what from appearances seemed to be tillers that had made the least growth in the fall, were attacked by the fly in the spring and another stem had been formed. Still, I do not think that any fixed rule can be laid down with regard to this. I believe that the Hessian Fly in spring will lay its eggs upon any stem or tiller that promises a good food supply for the young.'

2. Burning Refuse.—Many of the flax seeds of the summer brood are carried with the straw, and at threshing time are dislodged and fall down with the rubbish beneath the machine or are left in the straw. All dust and screenings should, therefore, be carefully destroyed, and all straw and small seeds should be either used during the winter or burnt before spring.

3. Treatment of Stubbles.—Most of the puparia of the summer brood are placed so low on the stems that they are left in the stubble when the wheat is cut. A large proportion of these give forth their flies in September, but some pass the winter in the stubble. An effective way to destroy these puparia is to plough down the stubbles deeply as soon as possible after the crop is cut, so as to place the insects so deep beneath the earth that the delicate flies, when they emerge, cannot reach the surface.

4. Trap Crops.—A method of reducing the numbers of the Hessian Fly, which is little practised, but which is spoken highly of by those who have adopted it, is the sowing of narrow strips of wheat in August, which will attract the females to lay their eggs, and which can afterwards be ploughed down. What is practically the same plan, is to run a harrow over fields as soon as the crop is cut, so as to start the volunteer crop from grain which has dropped in harvesting and induce a growth of wheat on the field sooner than otherwise would be the case.

5. Fertilizers.—When it is found that a young crop of fall wheat is only lightly infested, it is sometimes possible to stimulate the growth of the plants in spring by making a light application (so as not to cost too much) of some quick-acting special fertilizer such as nitrate of soda.

In cases such as we have many of in our fall wheat fields this autumn, where the attack is irregular in its occurrence, it will frequently be rather a difficult problem for a farmer to decide what his wisest course is. When, as is generally the case, there are patches in a field which have been destroyed, it is desirable to save such parts of the field as are uninjured. These patches can be sown in spring to some crop which will not require cultivation during growth, e.g., an early ripening barley, which can be cut at the same time as the fall wheat and the whole threshed as mixed feed. If, however, it is necessary to save the wheat separately, peas may be sown on these patches, and either the peas can be cut after the wheat, or the grain can be separated after threshing. In cases of bad infestation it would sometimes pay better to use the land at once for some other crop. It will, however, be necessary to replough the land deeply so as to bury the flax seeds too deep for the flies to get out, and then lay their eggs for the summer brood on spring wheat or the remnants of the crop of fall wheat. Unfortunately, the usual practice is merely to cultivate deeply, so as to produce a good seed bed. After reploughing, any crop may be sown except spring wheat. Barley and rye are also sometimes liable to attack, consequently other crops are preferable to barley or spring rye, such as oats, peas, corn or roots. There will also sometimes be cases when the farmer is uncertain what it is best to do, owing to the occurrence of uninjured patches in an otherwise badly infested field. In these cases, it will be best to wait and see how the wheat will turn out. If at last something else has to be substituted as a crop, probably the best returns will be obtained by sowing early-ripening corn, where a cultivator can be used, or early peas, where the patches are surrounded by wheat. Both of these crops may be sown as late even as the middle of June, and will usually give good results.

In the summer of 1899, as recorded in my last report, there was a remarkable outbreak of the Hessian Fly in the spring wheat crop throughout Manitoba, amounting to from 5 to 25 per cent of the crop. It is satisfactory to be able to record that there has been no recurrence of this outbreak during the past season. Mr. Hugh McKellar, Chief Clerk of the Department of Agriculture, writes under date December 18: 'I have much pleasure in advising you that this department did not receive any information this season, of the presence of the Hessian Fly in any part of the province.'

WHEAT-STEM MAGGOT
(*Meromyza americana*, Fitch).

Although the injury by this insect is not known to have been very serious during the past season, specimens have been sent in from a good many different places. It has been found attacking fall wheat in western Ontario in company with the Hessian Fly. The larger number of complaints and inquiries have come from Manitoba, and the North-west Territories, where the 'dead heads' caused by the summer brood had attracted attention and were thought by many to be the work of the Hessian Fly. The remedies for the Wheat-stem Maggot are practically the same as those for the Hessian Fly.

THE WHEAT-STEM SAW-FLY
(*Cephus pygmaeus*, L.).

This insect was reported from a few places in the North-west Territories during the summer of 1900, but no widespread injury was attributable to its attacks. Specimens were sent in from three places, and I have to thank my correspondents for taking a great deal of trouble in securing specimens and information concerning this interesting insect, which in any year may develop into a serious pest. A pretty full account of the insect and its life history was given in my report for 1896, when the most serious attack which has yet been recorded in Canada, was reported upon. This was at Souris, Man., on the farm of Mr. William Wenman. Mr. G. S. Tuxford, of Buffalo Lake, near Moose Jaw, Assa., has reported every year since then on the occurrence of the insect, and this year reports a serious outbreak, as follows :—

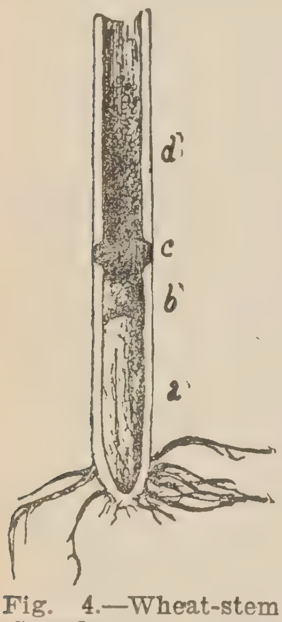


Fig. 4.—Wheat-stem Saw-fly ; *a*, cocoon; *b*, borings.

'Buffalo Lake, Moose Jaw, August 9.—Last summer I wrote you that there was not much sign of the Wheat-stem Saw-fly. Later I had to write again saying that some fields were rather badly attacked. This year, in our immediate neighbourhood of Buffalo Lake, the pest is assuming very serious proportions. We have just started wheat-cutting, and some fields especially all along the outside have from 20 to 40 per cent cut off and lying down. Our grain is ripening very rapidly this year ; a great deal is dead ripe now. We had four heavy rains on the 5th, 6th, 7th and 8th instant. Crops are from good to very good, though some fields sown on stubble will not give more than ten bushels to the acre.'

'September 18.—I have been trying to find some more stubbles in which the grubs of the Wheat-stem Saw-fly were hibernating ; but, owing to the early harvest, the late date of your request, and the many heavy rains, I find after many searches that it is impossible now to find any. At the end of July and early in August, it was very easy to trace and unearth the grub. I am sending you, however, a number of samples of the cut-off stems and heads. This is the same pest I complained of in the fall of 1897, and of which I then sent you samples. I remember you then advocated as one remedy, burning the stubbles in the fall. As the grub retires below the surface, would not this still leave it untouched ? It would be very difficult to get over a large area of ground by fall ploughing out here where the fall is so short.'—GEO. S. TUXFORD.

It will be remembered that all wheat in the North-west is spring wheat.

The early date at which this wheat was ripe, August 9, was doubtless due to the dry hot season. This also accounts for the small yield mentioned by Mr. Tuxford, of fields sown on stubble. The advantage of sowing on land summer fallowed, as a means of retaining moisture, was very marked in the West last season. The injury by insects to an infested field being most severe on the outside, is not an unusual

circumstance and merely shows the readiness with which flying insects settle down and deposit their eggs when suitable food for their young is found.

The work of the larvæ inside the stems sent from Buffalo Lake was plainly noticeable, and the Wheat-stem Saw-fly was undoubtedly the cause of the stems being cut off.

As pointed out by Mr. Tuxford, the larva does burrow down very deeply into the base of attacked stems ; but I think that the burning over of stubbles will be found a very useful remedy against this insect. Fall ploughing in most seasons in the West is difficult, owing to the lack of moisture; but where the Wheat-stem Saw-fly has been abundant, it is important that wheat should not be sown on stubble land unless a good burn has been secured, and if possible the land should be ploughed deeply either in fall or spring. Summer fallowing every other year as is done by many farmers at Moose Jaw, and doing the work early, before the middle of June, will do much to control this insect.

'Cottonwood, Assa., August 13.—Can you tell me the cause of my wheat being cut down in this way? As you notice, it is fully ripe. It was grown on summer fallow. We have had heavy rains lately, which probably accounts for so much being broken down. I shall be grateful for any information which will help me to destroy this grub.'

'August 31.—I undertook the search for the specimens you asked for, this afternoon, and although there were any number of cut-off wheat stems scattered on the field it was difficult to locate the lower end, as nearly all seemed to be gnawed off at a level with and sometimes below the ground.'—Harold D. Buchanan.

The wheat here referred to was injured by the larvæ, and was merely broken off by the wind and rain. The stems were cut off mostly at the surface of the ground, and the larvæ would have been destroyed in these instances by burning over the stubble.

'Osler, Sask., August 7.—In searching for more specimens of the swollen stems which we have been communicating about, I found to-day one fallen straw in which there was a small worm about ⅜th of an inch in length; it was at the broken point, but immediately below the joint, with no appearance of a swelling on the stem. I think this is a different trouble from that which causes the swollen stems.'

'September 15.—I was much interested to hear that you had found a specimen of the Wheat-stem Saw-fly larva in the wheat straw I sent. However, I do not think it can be at all prevalent here; for, while searching around so much for the swollen stems which I sent you at the same time, this was the only specimen I found which showed any trace of the work of an insect.'—Percy B. Grant.

Remedies.—The means which are to be recommended for checking the increase of the Wheat-stem Saw-fly are : The burning over or ploughing deeply of all stubbles, also burning of such straw as is not used by the following spring, and summer-fallowing in June every other year.

Undoubted specimens of Wheat-stem Saw-fly were sent with the above letters, but some other correspondents who wrote of this insect were mistaken as to the identity of the insect they complained of.

Injuries to Wheat due to Weather.

There were several curious conditions of wheat in the West last season, which can only be accounted for by unusual climatic conditions, chiefly the excessive drought, accompanied with great heat and bright sunshine in the last days of June. The ears of wheat were scalded just as they emerged from the sheath or just inside it. Shade trees which had been planted for several years were also severely injured by this unusual heat. The thermometer along the Canadian Pacific Railway through Manitoba and westward as far at any rate as Regina, registered 98 to 106 and 107 degrees Fahr. in the shade on the three successive days June 28, 29 and 30. Spruce trees

planted at various places were turned chocolate brown on the sunny side in one day, and many kinds of plants suffered severely. The injury to wheat was curiously local, but I cannot discover any other possible reason for the aborted and scalded heads in some places. Very interesting specimens were sent in by Mr. Geo. Wise and Mr. W. S. Wallace, of Shellmouth, Man., with a complete account of the injury and its occurrence on various soils and under different exposures. The affected area was eight miles long, north and south, and one mile wide. The injury to the ears was such that no theory could satisfactorily account for it, the ears being blighted and shrivelled up, sometimes at the tip, most frequently at the base, five or six florets being whitened and empty, and sometimes in the middle, with good grain forming at the base and at the tip. Frost and heat would either of them account for some of the characteristics, but not all. The injury lasted a very short time, and the chief peculiarity was that in adjoining fields grain at the same stage and apparently under exactly the same conditions was uninjured. Another curious distortion of stems of wheat plants was shown to me at Osler by Mr. Percy B. Grant, in which the stem was swollen, hardened and thickened, and as a rule bent rather abruptly so as to burst the sheath just above the top node of the stem. This attack resembled closely the work of the Joint-worm *(Isosoma)*. Mr. Grant wrote after considering the matter carefully and examining many specimens: 'My opinion of the matter is that the trouble is an excessive growth induced by the moist weather which came after a prolonged period of exceedingly dry weather.' I quite agree with Mr. Grant in this opinion, and so also do other botanists to whom I have shown the specimens.

'Osler, Sask., September 5.—I am sending you to-day a bundle of about 20 more or less injured stems ; all of these I cut off as near to the ground as possible, and all were standing except those which had broken at the injured points and fallen over. They show the swelling of the stem in various stages. I never saw this injury to wheat until this summer. Beginning with the middle of the month of June we had a spell of exceedingly hot and dry weather; the heat and drought gradually increasing till the end of the month, when nearly all the grain was out in head, although the straw was only from 6 inches to a foot high. Large patches of stubble land were materially injured by the want of moisture and, had the drought continued much longer, the bulk of the crop would have been ruined. However, about July 1, heavy rains set in, and there was an excess of moisture for nearly all the month. There was plenty of warmth in the ground, which, together with the moisture, pushed forward the growth at a rapid rate. The injured fields recovered rapidly, and those which had held their own during the dry spell sent up a rank growth. About a week after the rains began, numbers of the wheat stems were noticed to be lodged. The lodging continued for about a week and then stopped. The amount was variously estimated from one-twentieth to one-tenth, according to the field, being worst on new land (breaking) and least on summer fallow. The lodging was worst in the rankest spots of any particular field. It was always the largest stems with the largest heads which lodged. On closer examination, I found large numbers of stems still standing with the stems much swollen above the joints, and I noticed that the lodged stems were also swollen and had broken at the most distorted point. The swelling sometimes spread several inches up the stem, but in most cases was confined to one point until the stem bulged out so much that the sheath was burst and the inner stem protruded so much as to bend almost at a right angle, when it broke and was blown over by the wind. I found no lodged stems which did not show the swelling. The swollen stems which did not lodge were perhaps a little later in maturing than the rest of the crop.'—PERCY B. GRANT.

CUTWORMS IN WHEAT.

There was rather a serious outbreak of some kind of cutworm which attacked wheat fields in Manitoba. I was informed by the Department of Agriculture for that province, at the end of May last, that a great deal of harm had been done in the

Stonewall district. From Stonewall to Teulon it was reported that very few farms had escaped entirely, and in many cases the loss was serious. Mr. Arch. Woods, who lives about 2½ miles south of Teulon, had one field of 23 acres of wheat on summer-fallow three-quarters destroyed. The worms were said to clear the crop out completely, leaving the field as black as before it was sown. Mr. C. C. Castle lost 15 acres in the same way, and Mr. Mudd and other farmers in the same locality suffered to a similar extent. The caterpillars were almost full grown on May 19. Unfortunately no specimens of these cutworms were sent to the Division, so the species could not be identified with certainty. The Red-backed Cutworm *(Carneades ochrogaster,* Gn.) was abundant in Manitoba last summer, the caterpillars attacking turnips and many other low plants. The Rev. W. A. Burman reports injuries by this species at Deloraine, and Mr. A. W. Hanham informs me that this was the commonest moth at Winnipeg in the season of 1900. I have never actually detected this species attacking wheat ; but it is a well known pest of Indian corn, and it is quite possible that it may have been the culprit on this occasion.

GRASSHOPPERS IN MANITOBA.

About May 20 reports began to come in on the abundance of various kinds of grasshoppers in Manitoba, and by the end of the month the injuries had assumed serious proportions. An urgent invitation was received from the Provincial Minister of Agriculture for me to visit the districts and advise farmers. Unfortunately previous official engagements rendered this impossible until the end of June, when I proceeded to Winnipeg, and in company with Mr. Hugh McKellar, the Chief Clerk of the Department of Agriculture, visited a portion of the infested district. Through the courtesy of the Canadian Pacific Railway free transportation was provided to any part we wished to visit. Accordingly, leaving Winnipeg on July 2, we proceeded to Stockton on the Glenboro' Branch of the Canadian Pacific Railway, and then drove through the country worst infested round towards Wawanesa, Treesbank and Aweme, where we spent the night, and were hospitably entertained by Mr. Criddle, and where we received much valuable information and saw most interesting specimens of natural history objects. Leaving there the next morning, all too soon, we passed on to Douglas, another point where much harm had been done by locusts. In the afternoon a circuit was made round this place for several miles north-east and south-east. The next day I went on towards Brandon. The places in Manitoba where considerable injury was reported to have been done by locusts were along the line of the Canadian Pacific Railway from McGregor past Melbourne, Carberry, Douglas, Brandon and Oak Lake to Routledge, and south by Pipestone, Lauder, Hartney, and following the Souris river to Glenboro' and thence north-easterly to McGregor. At the time of my visit the grasshoppers were enormously abundant, but all farmers agreed that there was not at that time one where there had been one hundred a few weeks previously. I found every one well acquainted with the habits of the insects and the chief methods of fighting them. The article in my report for 1898, where all the best remedies are given, had been read carefully, but the greatest credit is certainly due to the Provincial Minister of Agriculture and his energetic Chief Clerk, Mr. McKellar, who had spared no effort in distributing information through the press, by holding meetings and circulating leaflets of use to farmers in meeting this outbreak. The farmers had responded promptly and had followed instructions well, by destroying the young insects both by burning them at night when they had collected on rows of straw spread across fields for the purpose, ploughing down stubble fields, the use of hopper-dosers, large numbers of which could be seen in all parts of the country, and by poisoning the insects with a mixture of bran and Paris green. There

Fig. 5.—The Rocky Mountain Locust.

is no doubt that the efforts put forth at this time had a very appreciable effect upon the numbers of the locusts, and much good was done in reducing the numbers during the hot dry period which prevailed throughout the month of June. The importance of ploughing down all stubble this autumn or next spring was impressed upon farmers by the Provincial Department of Agriculture, so as to complete the work of fighting the grasshoppers which was so well begun last spring. It will be noticed that the area infested this year was not the same as that which was invaded by locusts north of the Turtle Mountains during the two previous summers. A comparative freedom of those localities in southern Manitoba must be attributed, I believe, to the good work done by farmers last year. This serious outbreak was, no doubt, very much aggravated, if not entirely caused, by the dry hot season, which not only checked cultivated crops, but almost entirely prevented the growth of vegetation on the prairies. The only green thing for the grasshoppers to feed upon was the young and half-starved crops on cultivated land. Seeing the hundreds of acres in some places swept bare, I expected to find large swarms of the Rocky Mountain Locust (*Melanopolus spretus*, Uhler), but at only one place was this insect detected, and this was at Douglas. The species which were almost entirely answerable for the destruction of crops in Manitoba in 1900, were the native species *Melanopolus packardii* (Scudd.), *M. atlanis* (Riley), and *Camnula pellucida* (Scudd.). These were almost in equal numbers throughout the districts mentioned, and probably the first named was responsible for the larger proportion of the injury, being a large species somewhat like the well-known Two-striped Locust, but more active. It is easy to distinguish the species by the broader margin to the thorax and its bright blue tibiæ or shanks. There were many other parts of the West where grasshoppers were more than usually abundant, as is generally the case in dry seasons, but complaints were not made of their attacks on crops.

The following report from Mr. Norman Criddle, of Aweme, Man., gives a concise account of the outbreak at that place, which was one of the centres of worst attack.

'Aweme, Man., December 22.—With regard to the locusts, I forward some extracts from my note-book which may be of use to you. There is no doubt that the poisoned bran was far superior to anything else we tried. It was first used here with success by Mr. Harry Vane of this place.

April 24.—Locusts began hatching.

May 8.—Bulk of locusts are hatched.

May 14.—Several fields cleared off. Still hatching. H. Vane has tried Paris green with some success. Large numbers were ploughed under on edge of fields during night.

May 19.—Found a locust killed by Tachina flies ; seven grubs found in ground beneath it.

May 24.—Locusts rapidly eating wheat.

May 25.—Locusts beginning to fly.

May 29.—Seem to have done hatching ; are not doing as much damage as formerly. H. Vane has invented a machine somewhat similar to the 'hopper-doser,' only longer. It is made of sheet-iron and burns wood. With this and a mixture of Paris green and bran, the locusts are being kept under control.

May 30.—Hopper-dosers are being used at most places with some success, though not much.

May 31.—We are using Paris green bait with great success ; we are spreading it round all the fields.

June 6.—Half the locusts can fly.

June 7.—Still a few locusts hatching. Large increase of Tachina flies in some places.

June 12.—Several people report locusts killed by Tachina flies. H. Vane reports large numbers dead and dying from Tachina flies, two miles west. There are very few here killed by them.

June 20.—Locusts have been flying south-east (with the wind) in large numbers. These were : *M. spretus* and the Lesser Migratory ; quite a lot crossed the river.

June 23.—Lots of locusts leaving. They go with every puff of wind.

June 27.—Locusts have nearly all disappeared. A tremendous lot are dead round the field, killed by poisoned bran. They can be picked up by handfuls.

June 28.—Locusts have ceased to do damage. Most of them have disappeared.

August 24.—There has been a slight migration of locusts into this part the last few days. They were of the two migratory kinds, and came from the south-east.

August 30.—There is hardly a locust to be seen.

'The mixture of Paris green mentioned above is made as follows : One part Paris green, one part salt (the locusts will not eat it without), and eleven parts of bran. Mix into a mash, adding as much water as the stuff will hold. Spread in as small lumps as possible. We generally use a trowel or thin piece of iron. Get a little of the mixture on the edge and then fling so that it will spread some 15 yards. A pound of Paris green should make enough mixture to spread a strip two miles long by 15 yards wide. Fresh stuff should be spread every two days. The poison takes from two to five days to kill the locusts, so that they are able to fly long distances before they die. They eat it much more ravenously when they are full-sized than they do when young. Everybody who tried this remedy now swears by it ; several of them were heard to say that they will never fear locusts again. I only saw one locust attacked by a hair worm ; this was about 11 inches long, and was seen in July.

'No locusts were seen to lay eggs, nor have I been able to find any eggs in the ground. Those that did most damage were Nos. 7, 11 and 13 of those I send ; the damage done by them was about even. (They are probably the same, M. *atlanis*, Riley).

'There was also a small percentage of *M. spretus*, which you identified when you were here. I saw several cases of *M. spretus* mating with *M. atlanis* (No. 11). This was noted during the migration south-east on June 20, 21, 22 and 23. During this time they got vastly thicker where before there had been very few.

'The damage done here was greatly over-rated. We lost some 50 acres out of 260, and our fields were the first attacked. Other people lost perhaps a little more which was because they did nothing to stop the advance. The locusts had been increasing here for about three years, in fact, considerable damage was done in the latter part of 1899.'

The grasshoppers certainly were answerable for much loss ; but, as compared to the rest of the province, the area where their depredations were of a serious nature was not very large. Many causes added to the loss, which at the time was generally all attributed to grasshoppers. Drought, frost, wind and gophers all did their share of the injury, and as the species most concerned were native species which occur on the prairies in some numbers every year, it is to be hoped that this was merely an exceptional outbreak of local species, which will not recur next season. The probability of this recurrence is certainly rendered less probable by the work which has been done this autumn in following out the wise suggestions as to ploughing, which have been made by the provincial Department of Agriculture.

The two most abundant species throughout the province of Manitoba were *M. atlanis*, the Lesser Migratory Locust, and *Camnula pellucida*, the Pellucid Locust.

These two latter species occurred also in considerable numbers in the Okanagan valley, in British Columbia, where bunch grass pasture lands and grain crops were reported to be seriously affected.

WHITE GRUBS ATTACKING WHEAT.

The White Grub, the larva of the June beetle *(Lachnosterna)*, is a frequent enemy of pastures, and also occurs, as is too well known, in gardens as an enemy of the strawberry, and occasionally in farm lands is a destructive pest in corn fields. This year an attack of some importance on fall wheat was brought to my notice.

'Tancred (Lambton Co.), Ont., October 10.—The White Grub is eating out the fall wheat in this locality, especially on land that is inclined to be sandy. A year ago last spring the June Bugs or Beetles were so bad that my small plum and cherry trees were nearly destroyed by them. I was in a great quandary to know how the young foliage was being destroyed ; not a leaf was allowed to grow until long after other trees were in full leaf. I examined them carefully every day, but not a sign of insect life could I find, until one night I was going to the stable with a lantern, and the thought occurred to me, I'll look at the trees and see if I can find any insect working by night, for I knew the trees, which were two years old, should be exceedingly healthy and thrifty. To say I was surprised at what I found is putting it very mildly. Every twig and limb was one mass of crawling June Beetles. I prophesied a full crop of White Grubs last spring, and sure enough we got them.'—T. H. Myers.

Unfortunately, very little can be done when White Grubs are found attacking a crop. When the beetles attack fruit trees, spraying the foliage with arsenical poisons will destroy large numbers, and when the White Grubs are found destroying the grass on lawns some good may be done by spraying the grass freely with kerosene emulsion and then washing it in with water. The eggs of the June Beetles are laid in spring, and the young grubs hatch soon after, but do not attain their full growth till the middle of the next summer. They then change to pupæ, and soon afterwards into the perfect beetles, which, however, do not emerge until the following spring.

THE PEA WEEVIL OR 'PEA BUG'
(Bruchus pisorum, L.).

Attack.—A small, brownish-gray, very active beetle, one-fifth of an inch long, with two conspicuous black spots on the end of the body, which emerges from seed pease in autumn or in spring, leaving a small round hole. The insect is generally spoken of under the incorrect name of 'pea bug,' and infested pease, as 'buggy' pease. The egg is laid on the outside of the young pod, and the grub on hatching eats its way in and penetrates the nearest pea. Here it remains until full grown, consuming the interior of the pea and passing through all its stages, from a white fleshy grub to the chrysalis, and then to the perfect beetle. Some of the beetles, the percentage varying with the season, escape from the pease in the autumn and pass the winter hidden away under rubbish or about barns and other buildings. The greater number, however, do not leave the pease until the following spring, so that they are frequently sown with the seed.

Fig. 6.—Pea Weevil.

The perfect insects fly easily and resort to the pea fields about the time the blossoms appear. They have been observed feeding upon the leaves and flowers of the pea vines before the pods were formed, but the injury so done is inappreciable compared with the greater loss from the injury to the seeds by the grubs.

The injury by the Pea Weevil during the past season has been very serious indeed, and I wish to impress upon all pea growers in the districts where this insect prevails, the importance, or even necessity, of making a united effort to decrease this great annual loss by adopting some of the well known methods for the destruction of this pest.

The following are extracts from one or two of a great many letters on this subject:—

'Ottawa, November 26.—During the month of August I made a bicycle tour through the counties of Peterborough, Ontario, York and Brant, Waterloo, Wellington, Oxford, Perth, Middlesex, Lambton, Huron, Bruce, Grey and Dufferin. During this trip I paid considerable attention to the insect enemies of farm crops, and discussed the matter with many farmers. From my observations, I do not hesitate in saying that the Pea Weevil is the most important pest with which the farmers in the counties mentioned have to cope. I believe that the losses sustained in the province of Ontario from this enemy are such as should direct more attention to the methods of reducing or even exterminating this insect. In talking with farmers, even where the weevil has been present for a number of years, I found that neither the habits of the insect nor the proper methods of fumigating were very well understood. Farmers who a few years ago grew every year 20 to 30 acres of peas have become so discouraged that 5 or 10 is about the acreage they now grow, and many have dropped peas altogether out of their rotation.'—G. H. Clark.

'Vellore (York Co.), Ont., August 15.—The Pea Weevil is unusually bad this year. A large percentage of the pods have every kernel punctured, and some kernels have two insects in them. Last year, in early-sown field-peas, the bugs matured very early, and at threshing time, shortly after the harvest, they were in swarms in the barn, and the men were covered with them. It was an unusually hot season, with continued drought, which, I presume, hastened the development. Late sowing may result in fewer weevils, but this method is invariably disappointing in the yield and quality of pease. Many people sow one field from year to year, but they always depend upon the early ones for the best quality of pease and straw. A heavy crop of peas has the same beneficial effect upon land as clover, but to a less degree. This result is very apparent on heavy clay lands. The much easier preparation of pea stubble for wheat-growing is of great importance to those who make a specialty of wheat, and as wheat usually does better on pea land than on other stubble, farmers cling to pea growing for the above reason, which, in my opinion, is a very good one. I have told many farmers of the plan of fumigating with bisulphide of carbon; but, when extra trouble and cost as well as some danger are entailed, it seems next to impossible to get farmers to take hold of this; if, however, you could devise some method by which public exhibitions could be given, for instance in properly fitted-up railway cars to be moved from place to place, in which farmers could have their pease treated at a small cost, I think they would soon learn the value of this method, and if it were done for one season, there would be a general clamouring for more of it the second year. A couple of years in any district would so thoroughly demonstrate the benefits as to make it become a recognized duty of every pea-grower to treat his pease, and with this united action much good would result.'—John Lahmer.

'Waterford (Norfolk Co.), Ont., November 7.—There seem to be few Pea Moths here, but the Pea Weevils are very nearly equal in number to the pease.'—N. H. Cowdry.

'Belmont (Middlesex Co.), Ont., December 4.—Pea Weevils have done much harm. If a farmer treats his own seed pease with carbon bisulphide, unfortunately that does not prevent the weevils from his neighbours' fields from injuring his crop. There cannot be much good done unless we can in some way get united action. I am preparing to sow 12 acres of sod with peas next spring, for there is nothing like the pea-vine to thoroughly kill out the grass of a sod field. Before receiving your

letter I had already planned to treat my pease next year. Pease should be threshed as soon as ripe and immediately treated, before the weevil has attained full size or done much damage. If stored away in a barn and threshed in October, the bug has made its full growth and the damage is done.'—H. Pettit.

There are many valuable suggestions in the above letters, and I am convinced that if pea-growers on a large scale, as well as those who only grow a small quantity for their own use, would regularly fumigate with carbon bisulphide, in a very few years this united effort would have an appreciable effect on the unnecessary loss which occurs every year in this important crop. I believe that most farmers in the districts where the Pea Weevil occurs are pretty well acquainted with the life habits of the insect, and also know that the fumigation treatment is effective. By following the instructions which have been frequently given, and which are repeated here, there is really very little danger ; but of course the work must be done with care. Most of our large seed-growers and seed-dealers do regularly treat their seed, but I think a change for the better might be made by doing this work earlier. Not only is the carbon bisulphide more easily vaporized in hot weather, but its effect on the insects is much more fatal than in cold weather or later in the season, when the weevils are in the torpid state in which they pass the winter. The sooner the fumigation is done after the pease are ripe, naturally, the less the seeds will have been eaten away by the grubs and injured. Moreover, by postponing the fumigation until late in the autumn, in some seasons a large proportion of the weevils will have left the pease and escaped before the operation.

Any farmer can treat his own seed easily and with perfect safety in the following way : Place the quantity of pease to be treated in an ordinary 45 gallon coal-oil barrel, which will hold about five bushels of pease. The quantity of carbon bisulphide which has been found necessary to destroy the weevil is one ounce to every hundred pounds of seed—the treatment to last for 48 hours. Therefore, for the above quantity, as pease weigh from 60 to 65 pounds to the bushel, 3 ounces would be required if the barrel were filled. The chemical may be poured right on to the pease, and the barrel must then be covered quickly and closely, first with a thick cloth or canvas which has been damped in water, and then with boards. The carbon bisulphide will not injure the seed in any way, either as to vitality or as to its wholesomeness as food. Carbon bisulphide is a colourless liquid which readily turns into vapour when exposed to the air, except in very cold weather. This vapour is quite invisible, but has a very strong unpleasant odour. It is heavier than air and therefore sinks quickly to the bottom of and permeates the contents of any closed receptacle in which it is used to free grain of infesting insects. It is, however, extremely inflammable both in the liquid and vapour form ; consequently great care must be taken not to bring any flame, not even a lighted pipe or cigar, near the liquid or barrel during the treatment. The pease or other grain must be left in the tightly closed barrel for 48 hours to destroy the weevils ; it will therefore be best to place the barrel in an outside shed at some distance from the living-house.

The late sowing of pease is certainly useful in preventing attack by Pea Weevil, but the method is not in much favour with farmers, because late sown peas in most seasons are liable to be so badly attacked by mildew as to reduce very much the value of the crop.

Holding over seed.—An easy remedy and an excellent one when only a small quantity of seed is required, is to hold over until the second year after harvesting. This must be done in close bags so as to prevent the escape of the beetle which naturally emerge before the end of the second season, and as they cannot perforate bags even when these are made only of paper, they must die ; for, unlike the Bean Weevil, they cannot propagate in dry grain. The vitality of pease is not injured to any appreciable degree by this delay of one year before sowing. At the time of sowing the seed should be examined and if necessary hand picked ; every grain which has been perforated should be discarded, as it has been proved that it is impossible to grow strong plants from weevilled pease.

The great need in Ontario to-day in this matter is concerted action among all concerned. If a few only treat their pease carefully, little good can be done in controlling this serious enemy, but on the other hand, it cannot be too often stated that, as is often averred by farmers, it certainly is not true that there is no use in one man doing what is right when others close at hand, do nothing. This is a big undertaking ; the Pea Weevil has now for many years been practically increasing year by year, and has now obtained such a foothold that it can only be controlled by stirring up public opinion to the extent of inducing everybody concerned to do something. As a means to this end, Prof. Lochhead, of the Ontario Agricultural College, makes the practical suggestion of bringing the subject prominently forward at the winter meetings of every farmers' institute in the province. This could be very easily done, the life history of the Pea Weevil is perfectly well known and has been published over and over again in official reports, both federal and provincial, as well as in agricultural journals. There is a competent staff of speakers for the farmers' institutes, and it would be almost impossible to hold a meeting in any of the pea-growing counties where there would not be several who could speak on this insect and its work, to the great advantage of many present.

There is, however, every necessity that those who discuss the matter, should prepare themselves beforehand and make it very plain which insect is being discussed. On frequent occasions when reports have been received from correspondents, I have to write to them before I can be sure which insect they mean. The Pea Weevil is the short, roundish, hard beetle which occurs, at the time when it is most often noticed, among seed pease from which it has emerged, leaving a perfectly round hole in the hollowed-out pea, in which it passed its preparatory stages. This insect is shown enlarged, and of the natural size at figure 6. The Pea Moth, as it is generally seen by farmers, is in the form of the caterpillar, usually called the 'worm,' in the pea pods, where the white caterpillars devour the green pease from the outside, leaving a ragged cavity and a mass of excrement. The perfect insect, the moth, Fig. 8, is very rarely seen. It resembles very much the Codling Moth, of the apple, but is of a general slaty gray colour instead of bronzy brown. The Destructive Pea Aphis is a soft-bodied green plant-louse, shown below, very much enlarged. These plant-lice cluster in enormous numbers at the ends of the shoots of peas, of all kinds, clovers and vetches.

THE DESTRUCTIVE PEA APHIS
(Nectarophora destructor, Jnsn.).

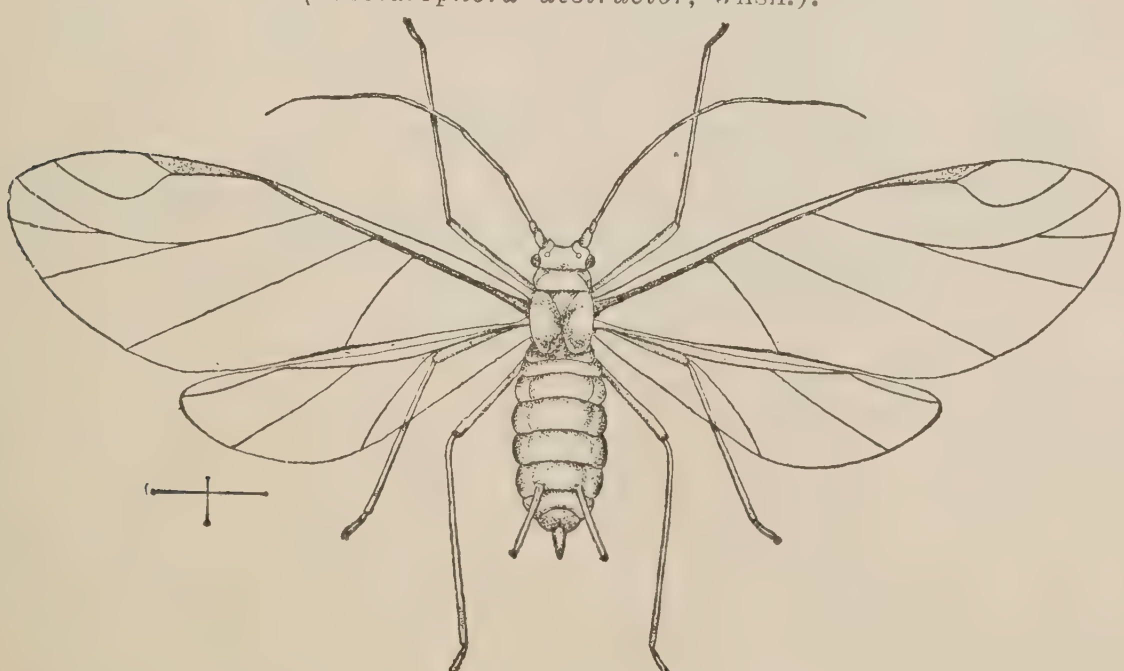


Fig. 7.—The Destructive Pea Aphis; winged viviparous female—enlarged.
(After Johnson, Md. Agr. Exp. Sta. Bul. 63.)

In my last report considerable space was devoted to the Destructive Pea Aphis, a new pest of the pea, of which no previous attack had been recorded in Canada. The injury extended from all parts of the Maritime Provinces, through Quebec to the western boundaries of Ontario, and the loss in many places was serious. Not only did it occur in Canada, but much greater injury was caused by it in certain of the United States, as Maryland, Delaware, New Jersey, New York, Connecticut, &c. Excellent work has been done upon this insect in Maryland by its describer, Prof. W. G. Johnson, and in Delaware, by Prof. E. Dwight Sanderson, both of whom have published bulletins on the subject.

In Canada during the past season, although the Destructive Pea Aphis has occurred throughout most of the districts visited by it last year, the numbers and injuries have been decidedly less. It has been discovered in the United States that this insect should perhaps be considered more particularly an enemy of clover than of peas. In Canada the species has been found only in small numbers on clover, and no perceptible harm has either been observed or reported to this crop. Wherever the Destructive Pea Aphis was observed, it was attacked to a very noticeable degree by parasitic enemies. All of the species mentioned in my last report were found during the past season in even greater abundance, and in addition to these with every outbreak the fungous disease due to *Empusa aphidis* was more or less prevalent. At Ottawa by far the most inveterate enemy of the plant-lice was the small orange larva of a species of *Diplosis* ; these minute maggots, about one-tenth of an inch in length, crawled about on the surface of the pea vines and worked very much in the same way as the larvæ of the *Syrphidae*, or Hover Flies ; creeping up to an aphis they transfixed it and held it up, raised from the surface, while they sucked out the juices of its body. The growth of these little creatures was very rapid and there were several broods in the season. When full grown these *Diplosis* larvæ spun a minute cocoon on the stem of the pea plant, or, falling to the ground, spun it there close to the surface, attaching several grains of sand to the outside. This cocoon closely resembles that of the Wheat Midge, or the tiny Cecidomyid *Lasioptera vitis*, of Osten Sacken, which emerges from the Grape Vine Tomato Gall. The winter is passed by the larva inside the cocoon. The plants most seriously attacked in Canada this year were late field peas, sweet peas in gardens and the new crop plant known as the Grass Pea, which is being grown in some districts on account of its exemption from the attacks of the Pea Weevil. Several occurrences of the Destructive Pea Aphis were watched from the time they first appeared this year at Ottawa, on July 27, until the time when permanent snow fell, and a few specimens were found on clover by digging up the plants from under the snow. Parasites of several kinds were abundant throughout the season, and a constant warfare was waged. No sooner did the aphis increase, and appear in large numbers than the parasites appeared in greater numbers and brought them down again suddenly almost to a point of total annihilation. However, at the end of the season a few specimens of the aphis could be found wherever there were chance seedlings of peas and upon late sweet peas, as well as the few mentioned above as found on clover. The attacks of this insect upon the plants where it occurs are of a very pernicious nature, the plants soon becoming stunted and the flowers, if produced, quickly withering up. Sweet peas which were sown early and had made good growth stopped flowering as soon as the insects appeared, and late sown plants were dwarfed and made no further growth after the attack began.

Last year the worst complaints of injury came from the Maritime Provinces. This year Mr. Robertson, the Superintendent of the Experimental Farm for the Maritime Provinces, writes : 'The Pea Aphis began its work this season in Nova Scotia just about the same time as last year and it looked as if it was going to be just as destructive ; but for some unaccountable reason it disappeared all at once, though not until it had completely destroyed peas which were sown late or on poor ground, where they had a sickly growth to begin with. Such as had a strong and vigorous growth were not much hurt. I did not notice any on clover.'

The injury in Ontario is summarised in the following letter from Messrs. the John H. Allan Seed Company :—

'Picton (Prince Edward Co.), Ontario, November 19.—The Pea Aphis appeared in some portions of Ontario last year and more largely in the United States, and has done material damage to the pea crop. This season it has done considerable damage in New York State, Michigan and Wisconsin. Last season, as well as this, it caused injury in Prince Edward county, as well as in Lennox and Addington. We are also told that it did much damage in Renfrew county.'

The losses due to the Destructive Pea Aphis in the Atlantic Coast States have been shown by Prof. Johnson to be enormous, and he quotes from *The Trade*, a canned goods journal, published in Baltimore, the information that the crop of peas of the Atlantic coast this year will not exceed on the outside one-third of what it was even last year, and continues : 'This is about as serious as it can be, when it is taken into account that it is mostly due to this one pest.' . . . 'With this year's experience, however, we have shown conclusively in our experiments and practical work in the field that this insect can be kept in control to a very great extent if taken in hand in time. In the first place, the peas must be planted in rows 24 or 30 inches apart, and not broadcast or in drills, as is frequently the case.' Many remedies were experimented with by Prof. Johnson, and it was found that what he has called the 'brush and cultivator method' was the most effective remedy. For this it is necessary that the peas should be planted in rows as stated above, and when the insects are noticed the vines are brushed backward and forward with a good pine switch, in front of an Iron Age cultivator, drawn by a single horse. In this manner the plant-lice, which leave the vines quickly when these are shaken, were covered up as soon as they fell to the ground, and a large proportion of them destroyed. The operation was not repeated until the third day, as it usually required over 48 hours to destroy the insects when covered with earth. The particulars are given of an extensive experiment, where a 600-acre pea plantation was practically saved by the persistent and energetic efforts of Mr. C. H. Pearson, of Baltimore. All the methods from a practical standpoint were tried on this place, and it was found that the brush and cultivator method was the most effective. Forty men were engaged, and the 600 acres of peas were brushed and cultivated every third day for two weeks, and in this manner the entire field was saved, netting the owner from 25,000 to 30,000 cases of pease, of two dozen tins each. The year before the pease over the same area were broadcasted, so there was no opportunity of fighting the pest, and, as a consequence, 480 acres were entirely ruined. Another method which was tried with considerable success, consisted of a brush which dislodged the insects so that they fell into a pan containing coal oil and water, drawn between the rows of peas. In this way a bushel of plant-lice were caught to each row of peas 125 rods long. Spraying was tested after a thorough trial, upon 100 acres, and all sorts of insecticides for sucking insects were used, but this method of fighting the insect was abandoned, because no spray could be found which would destroy a large enough percentage of the insects to warrant the expense of the operation

THE PEA MOTH
(*Semasia nigricana*, Steph.).

This insect was unusually abundant in the provinces of Ontario and Quebec during the season of 1900. Prof. Lochhead reports it as troublesome this season in the northern counties of Ontario: Grey, Bruce, Huron, Perth, Dufferin and Wellington, but it does not appear to have been quite so destructive as usual in the Maritime Provinces, although inquiries have been received from all three provinces. Some experiments as yet incomplete may be reported upon provisionally, as they appear to be promising. Mr. J. E. Wetmore, of Clifton, King's county, N.B., was good enough, at my request, to try spraying the peas at the time the pods were forming, with the same spray of Paris green and water as is used for the Codling Moth. This experiment was suggested by the similarity of the habits of the Pea Moth and those of the Codling Moth, and although only two sprayings were given, the results were so promising as to show the importance of careful experiments being carried out in spraying peas to prevent loss from the Pea Moth. There should be at least three sprayings, the first applied when the blossoms begin to fall, the second one a week later, and the third ten days later again. As liquids will not adhere easily to such plants as the pea, owing to their waxy covering, it is necessary, after mixing the Paris green and water, 1 pound to 100 gallons, to add whale-oil soap, or some other soap, in the proportion of 1 pound to every 25 gallons of the mixture. Mr. Wetmore's report on the result of two sprayings, is as follows :—

Fig. 8.—Pea Moth : caterpillar and moth. 2 and 4, enlarged.

'Clifton, N.B., October 4.—I think that the injury to pease in this section was less this year than for a long time previously, and, therefore, it was not a very favourable year for the experiment. Early peas never suffer much from the Pea Moth, therefore I did not spray them, and they were not injured by the moth, except a few at the latter end of the pick. I mixed the spray as you directed and applied it with an Electric Sprayer, which only worked tolerably well. The first application was made on July 21, when the blossoms were beginning to fall from the pease, the second one on July 28. I did not spray again, as the pease were about ready for use, and I did not care to have the mixture on them. I gave the vines about the blossoms a good soaking. I picked the first pease for the table on August 1, half sprayed and half unsprayed, and found one caterpillar in each. August 11, tested pease again, but I could not detect any difference in sprayed and unsprayed pease. Very few pods were affected in either, not more than one in fifty. I examined them for moth several times after this, and found the number of affected pods increasing steadily in both sprayed and unsprayed towards the end of the season. There was, however, a noticeable difference between the sprayed and unsprayed at the end of the season, about 9 or 10 per cent of the sprayed pods were affected, while 20 to 25 per cent of the unsprayed were attacked. I also examined pease on my neighbours' plots and found about 25 per cent infested. This result was not entirely satisfactory to me, because the mixture failed to keep the moth off entirely, though the vines were well drenched.

'I do not think, however, that the moth always lays its eggs in the very early stages. I have found a number of very young grubs on pease ready for the table, though the majority were much older. In fact, I found all stages of growth at that period, from very young to big fat grubs.'—J. E. WETMORE.

THE VARIEGATED CUTWORM.

(*Peridroma saucia*, Hbn.)

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 9. The Variegated Cutworm ; Fig. 10, moth ; Fig. 11, pupa.
(All natural size.)

One of the most remarkable outbreaks of an injurious insect which has ever been recorded in Canada, occurred last summer on the Pacific Coast, extending from Oregon through Washington, and in every part of British Columbia from which reports have been received. The loss in all garden crops was enormous, and was due to the attacks of the caterpillar of one of the noctuid or 'owlet moths (*Peridroma saucia*, Hbn.), which has been named somewhat inappropriately the Variegated Cutworm. The parent moth is known in England under the name of the 'Pearly Underwing.' Not only did this insect occur in disastrous numbers in British Columbia, but it was rather more than usually abundant in Manitoba and Ontario. The first intimation of the outbreak was received from Kelowna in the Okanagan Valley, British Columbia, in a letter dated July 9; but every day after this for more than a month letters were received, accompanied by specimens, all of which proved to be of the same species. The following extracts from correspondence have been selected to show the extent of the injury, and are given at some length on account of the importance of the outbreak :—

'Kelowna, B.C., July 9.—I send you under separate cover in a tin box a half dozen specimens of a worm that is eating our tobacco crop quite seriously. Please tell me what they are and what I must do to destroy them.'—H. G. Watson.

Mr. Watson was written at once that the caterpillars were the so-called Variegated Cutworm, and the remedies of most use for this class of injurious insects were recommended. Immediately after this began an extensive correspondence with Mr. J. R. Anderson, the Deputy Minister of Agriculture for the Province of British Columbia, who was most untiring in his efforts to distribute information as to the habits of this insect and the best means of meeting its attacks. As soon as any new feature was discovered, which it was thought would be of use to the farmers and gardeners of British Columbia, circulars and emergency bulletins were issued and distributed broadcast. I have no hesitation in saying that the prompt and energetic measures which were carried out by Mr. Anderson in this phenomenal outbreak of such a large and injurious caterpillar, with the habits of which farmers and gardeners were wholly unacquainted, was the means of saving thousands, if not hundreds of thousands, of dollars worth of crops. That the outbreak was of an unusual nature was shown by the receipt on July 20 of the following telegram from Mr. Anderson :—

Victoria, B.C.—Wire advice on receipt my letter seventeenth. Case very urgent.'

The following is the letter referrd to :—

'Victoria, B.C., July 17.—By the present opportunity I am sending you specimens of cutworm, an invasion of which has suddenly set in. They are devastating everything they came across. The first report I received from Lulu Island, where Mr. Tom Wilson found them feeding at night. This was quickly followed by reports from

Cowitchan, Chilliwack, and lastly from Saanich, the outbreak therefore is widespread, and is naturally causing great consternation. You will see that they are of various sizes, but I take it they are all the same species, although quite different in appearance. I have sent a letter to *The Colonist*, giving extracts from your reports as to the remedies for cutworms. Let me have further advice as soon as possible.'—J. R. ANDERSON.

'July 21.—I wired you yesterday asking you to advise me by telegraph as to the subject of my letter of the 17th. Since the 17th I have been deluged with reports of the ravages of these cutworms, and I have published further articles relating to their life history, the remedies, &c., taken chiefly from your reports and from Prof. Slingerland's bulletin. I went out yesterday to Mr. Wrigley's place at South Saanich and witnessed the depredations of these pests. It is truly astonishing to see the manner in which whole fields of carrots and other things are cleared off. Mr. Wrigley was spraying vigorously.'—J. R. A.

'July 30.—Your letter of 23rd inst. received this morning. I am printing part of it in an additional leaflet, giving also extracts from a letter from Mr. Brodie, of the Washington Agricultural Experiment Station. These are going to all the newspapers for publication. The infestation by this insect in Washington amounts to a plague, and I fear most root crops will be lost, as well as other green crops. In consequence of the exhaustion of Paris green in the province and adjoining states, the government was appealed to. I therefore wired you this morning to send 500 pounds.'

'July 31.—I inclose you a copy of an additional leaflet I have published. A meeting of the Victoria Farmer's Institute was held last night at the Royal Oak, for the purpose of considering the cutworm question. I attended it, and read your letter. We all wished you could have been there. The experience of those present went to show that those who used the poisoned bran as you directed were very successful in killing off the cutworm, but the numbers of these are so great that it seems almost hopeless. There was, however, after the meeting, a more hopeful spirit among those present, and I think, if we only had Paris green, every one would use it. The lawns in front of the government buildings here are swarming with cutworms. I have induced the caretaker to have them rolled. This is killing them by thousands.'

'August 2.—I was told by a gentleman from Salt Spring Island that he had noticed five cases of the cutworms devouring those which had been poisoned I am also told that some of the worms are being attacked by parasites, but I have not seen anything of this myself as yet.'

'August 6.—Paris green came safely to hand yesterday. I am now distributing it to the different Secretaries of Farmers' Institutes.'

'August 15.—I am much obliged for the specimen of *Peridroma saucia* which you have sent. This moth will be very useful to identify our British Columbian specimens by, when they emerge. None of the chrysalids have given the moths yet here, but Mr. Tom Wilson gave me one a day or two ago when I was in Vancouver, which he had hatched out. It is undoubtedly the same insect. Do you think it at all likely that another brood of caterpillars may hatch out before winter?'

'August 16.—I inclose you a copy of a part of a letter from Mrs. J. S. Place, of Dog Creek, B.C., This is a part of the province which I do not think you are acquainted with. I think you will find the letter of great interest, as it gives the date when the eggs were laid. Mrs. Scott. the wife of the mayor of New Westminster, told me that a short time ago she noticed a number of small loopers where the light happened to fall on a light coloured patch on the carpet in her drawing room. She found that they were dropping from a curtain cord where she found the remains of a cluster of eggs. She had previously destroyed several of these egg-clusters which she had found deposited on the curtains and other places in the room.'

The following is the letter Mr. Anderson refers to:—

'Dog Creek, B.C., August 10.—We had an acre and a half of potatoes, and the cutworms ate all the leaves off in two weeks, leaving only the stalks. When they had

finished eating the leaves of the potatoes, they began to cross the fence into the vegetable garden. The fence was just covered with them. However, we cut a ditch through the garden and turned on water. They then tried to cross and were drowned by thousands. Some managed to get over on straws and bits of twigs. We have killed large numbers with Paris green and lime, but we happened to be without any Paris green, and they got a week's start of us. Now I want to ask a few questions. The 28th June was a very hot day, and we had clothes out on the line. When I gathered them in, the clothes had about 50 or 60 separate lots of eggs. I had to get a knife and scrape them off. They were a pale yellow, nearly white. I then went to look at the hops, and found there quite a lot of these egg clusters underneath the leaves. Then we began to look round and found that the same eggs were laid on the windows and all over the verandah. We set to work and got steps and crushed all we could see, which was a very large amount. I thought of sending you some of these leaves, and I am sorry I did not do so. The caterpillars have eaten the potatoes, and now they are thick on the peas and beans. They will eat the end off a pod and then eat the inside. Of onions they eat the top and then go down the stalks. Do you think that the eggs mentioned above are what the cutworms now so troublesome hatch from ?'—Mrs. J. S. Place.

In reply to this letter, Mr. Anderson answered that he had no doubt that the eggs mentioned were those of the parent of the Variegated Cutworm, and there is no doubt he was accurate in this opinion. Dog Creek is in one of the arid districts of British Columbia, where irrigation is resorted to, and the plan adopted by Mrs. Place in preventing the cutworms from travelling by turning on water is an excellent one which has been resorted to very satisfactorily at Kelowna and Vernon, B.C., during this outbreak.

'Victoria, B.C., September 20.—I have a number of the chrysalids from caterpillars sent to me by Mr. E. A. Carew-Gibson, under date of September 2, from the 150 Mile House, now inclosed in a gauze cage. I will put them out of doors as you suggest, and place some twigs, leaves, &c., for the moths to lay their eggs on when they emerge. Mr. Gibson says in his letter accompanying the caterpillars : "I am sending you by this mail a box containing about 20 pupæ and a handful of larvæ of the year's pest—cutworms. I take it these are the same which are so bad all over the province this year. The amount of damage done and the extent of country covered seems extraordinary. At the mining camp at Horse Fly, an isolated settlement 32 miles from here, cutworms have this year completely destroyed the gardens, and have denuded potato fields of their foliage. They have been equally harmful at Soda Creek and Quesnelle Mouth. We were not able to get hold of the Paris green as quickly as it was needed, and the damage was nearly accomplished before the larvæ were much noticed. These cutworms do not seem at all particular about their diet. The handful I send were picked from under hop vines, nasturtiums and sweet peas, growing against this house." I thought that you would like to get this note of the occurrence at 150 Mile House, because it is so far out of the way.'—J. R. Anderson.

'September 21.—Several of the moths from Mr. Gibson's caterpillars have already emerged this morning. This surprised me, as I thought they would be much later.'

To the above quotations from a few of the letters received from Mr. J. R. Anderson, the following extracts from other correspondents, may be added :—

'New Westminster, B.C., July 21.—Cutworms are doing immense damage to all crops on the lower mainland. I have been afraid of this for some time, as I noticed the extraordinary number of common cutworm moths at "sugar". Kindly let me know at once what you advise as the best means of keeping them down. I have found that tobacco sprayed over plants makes them distasteful to the caterpillars. They are everywhere, in fields, in gardens and in greenhouses.'—W. A. Dashwood-Jones.

'Vernon, B.C., July 23.—We forward to-day a tin box containing sugar beet and grubs. We first noticed this grub around an old potato pit where we had potatoes

for the pigs last fall. They have destroyed about an acre of sugar beet adjoining this pit. We have them also around the house on the clover, and they have stripped the hops from the verandah. We have a few on our hop-yards, but very few. We trust that they will not increase on the hops, as they are too far advanced to spray with Paris green. We are poisoning with Paris green on our sugar beet, and also surrounding the patch with a ditch and water to try and stop them travelling. Are they likely to be worse next year.'—D. C. RICARDO.

'Comox, B.C., July 23.—I send a number of caterpillars. Please let me know all about them, as they are in such numbers here at present as to be a perfect scourge, and threaten to destroy all vegetation. They attack everything green, field crops, garden crops and house plants. They are here in millions, and are as destructive to the potato as the Colorado Beetle, but are equally so to turnips and other crops. They eat every portion of the leaf except the ribs, which they leave bare and dead. I have been all over the district, and find the pest universal. We are spraying with Paris green.'—JOHN J. R. MILLAR.

'Agassiz, B.C., July 24.—I send five cutworms. These are so plentiful that I picked five on the walk without moving a foot. They are eating the leaves of many of the shrubs, vines, &c., besides garden plants. In the orchard they have attacked the pears. In the field they are eating the fleshy outside covering of the pea pods. The only remedy I can suggest is to sweeten a bran mash and doctor it with Paris green. They are here in swarms. What can we do to protect our crops ?'—THOS. A. SHARPE.

'Froek, B.C., July 25.—I wish you could tell me how to get rid of these worms out of my garden and potato fields. The ground is just covered with them. They eat leaves, stems and everything of vegetables, and then take the root very often. They have destroyed everything for me this year, so that I shall have nothing for winter use. Is there anything I can do to prevent these things next year ? I never saw anything like them before. In the parcel I send, the small ones are picked from the stems and the big ones from the ground.'—NILS FRALANDER.

'Victoria, B.C., July 25.—The enormous numbers of cutworms have naturally reduced the food supply and made it necessary for them to change their usual feeding habits. This necessitates a corresponding change in methods of fighting them. I find them distributed all over all kinds of plants, vegetables, flowers, &c., and feeding at all times of the day and night ; in roots such as carrots and mangels, they eat holes and live inside these ; also in tomatoes ; in fact, they are everywhere. Many complaints are coming in now of their injuring fruit trees and fruit, and the loss to the farming community on their account is going to be very large. In many cases people are slow to use Paris green, being afraid of it, or use it too late. I have had excellent results where the pests are distributed promiscuously over the plants by using a Paris green mixture, dusted or blown through the entire leaf surface, one pound of Paris green to twenty pounds of flour, while the bran and arsenic mixture is effective only in certain instances. A Paris green spray is not so generally effective as the powder form, but I think this is due to the fact that many persons spray too heavily and most of the poison is washed off the plants. Reports are coming in now from Saanich that grain crops are suffering and the work of the cutworms seems almost identical with that of the true Army Worm. It is certainly the most serious occurrence of this nature since I have been in office. I shall be glad to know the proper names of the species as soon as you have reared them. I suppose there will be several different kinds.'—R. M. PALMER.

'Victoria, B.C., August 17.—It is quite a relief to know that you consider it unlikely that we shall have another plague of cutworms next year. Such an event would be indeed disastrous. My own investigations have led me to come to the same conclusions as were stated in your recent letter to Mr. Anderson, namely, that so many of the cutworms are parasitized, at any rate in some localities, that there is no reason to anticipate such a plague in 1901, as we have had this season.'—R. M. PALMER.

'Agassiz, B.C., July 27.—There is what is to me a strange feature in this attack, the cutworms are eating a number of my Thuyas. *Thuya vervaeneana* is one that they appear to be particularly fond of. There appears to be a slacking off in the numbers of these cutworms now, but this may be only temporary. However, many are going into chrysalis just under the suface of the ground. Would it be well to plough clover fields with a shallow furrow and plough or disc with a spading harrow all other fields? Would this have any effect in lessening the caterpillars or killing the chrysalids? I dislike the idea of ploughing up my clover, but would not hesitate if it would be useful. I am told that some hop yards will not pick a hop. Mr. Breed, in Saanich, is one who has no crop this year, on account of the cutworms, and they have begun on the yards here. I saw a field of four acres of potatoes this morning, and I think there is not a hatful of foliage left in the field. Ours, so far, are saved, but how long this will continue I do not know. I sprayed roots, potatoes and trees, until all my poison was gone, and now I would use poisoned bait if I could get the poison, but cannot before Monday or Tuesday.'—Thos. A. Sharpe.

'Maywood, Victoria, B.C., July 28.—I send specimens of a cutworm which is devastating the gardens and fields round Victoria. Whole crops of roots are entirely eaten up, and the corn is now being attacked. It is the most serious disaster I have seen in the eleven years I have lived here. Round five turnips in my garden I found 236 cutworms. Many farmers have lost their entire crops of carrots, potatoes and other roots. A row of sweet peas, sprayed with double-strength Paris green, was again covered 12 hours later. Nothing escapes. Carnations have every flower bud eaten out. Dahlias are eaten to the stems. We shall soon have nothing left. They have attacked the flowers in the conservatories and the tomato houses, where I have poisoned them with bran and Paris green.'—J. W. Webb.

'Victoria, B.C., July 30.—Yesterday I drove out about five miles and saw several gardens. I assure you it was a sorry sight. In some places even rhubarb was entirely stripped, only the stalks and leaf ribs being left. Potatoes were stripped to bare stalks, and the worms were eating the tubers. Some tubers had four or five cutworms in them. These latter are so abundant that they are crawling about in search of food by day.'—Geo. A. Knight.

'Langley Prairie, B.C., July 30.—The worms are destroying potatoes and root crops. Yesterday was the first day I noticed them. They have been very bad at Chilliwack.'—D. H. Nelson.

'Kaslo, B.C., July 31.—We have been suffering all through the Kootenays for several weeks past with a plague of grubs, not the ordinary cutworm, but a dark grub which has attacked all vegetables and almost all flowers. I am now trying whale-oil soap and quassia. The latter I have found the best thing for roses, but from all I can see these remedies will have no effect against this grub.'—Geo. Alexander.

'Armstrong, B.C., August 1.—The cutworms are much larger than our ordinary cutworm, and have been much later in appearing. They are doing an immense amount of damage nearly all over the province, some potato fields being about destroyed. Some people assert that it is the Army Worm.'—Donald Graham.

'Victoria, B.C., August 3.—I have one moth hatched out and many chrysalids, so I hope the worst is over for this season. Still there are many small larvæ yet.'—R. M. Palmer.

'Agassiz, B.C., August 6.—I am sending cutworms of very different sizes. I found them and the chrysalids in the same bed of garden peas. There were so many chrysalids that I was in hopes the trouble was nearly over, but, if the smaller ones have to grow as large as the big ones, it must be some time yet before they pass away.'—Wm. S. Jemmett.

'Agassiz, B.C., August 11.—The cutworm nuisance seems to be abating at last.'—Thos. A. Sharpe.

'Nanaimo, B.C., August 13.—I send you a few notes on *Peridroma saucia.* The moth was very common round my house in June, and I captured several. I do not remember to have taken it in British Columbia before. The first caterpillars I saw were in a field of potatoes at Boat Harbour, on July 15. I did not recognize the caterpillar. It is not one of our common British Columbian cutworms. Since July 15, of course, everybody has heard of it, and the damage done has been very considerable. Mangels, potatoes, turnips, &c., have been bored into, wherever near the surface of the ground. The caterpillars have travelled a little when food was scarce, and they have stripped nettles, thistles and bracken just outside fences. They have also attacked the second growth of clover, and have climbed fruit trees when planted near garden stuff. The larvæ are now pupating, and some moths have already appeared. This, I think, establishes the fact of a double brood. I collected at willows, and presume I should have taken some of the moths, had they hibernated as such.'—Rev. G. W. Taylor.

'Nanaimo, B.C., August 25.—*P. saucia* is now coming out of pupa state in considerable numbers. I have no doubt about two broods now, and I fear an attack of caterpillars must be expected in spring.'—G. W. T.

'Kaslo, B.C., August 16.—I made a tour through some ground which I knew had been infested with cutworms, but found that they had all pupated, so I mailed you last night a box of pupæ. These were so thick in the ground that every spade would turn up from three to nine pupæ. These caterpillars when young were blackish-gray on the back and lightish stone colour on the legs and belly, with a row of four yellowish spots on the back. After the last moult the general colour is greenish stone, and the four spots fade considerably, in some specimens they are almost imperceptible. They vary much in colour and size. If I am correct in my supposition of the moth of these pests, it has not appeared here before in any numbers. I had none of the moths prior to last spring. The last visitation of cutworms was in 1892.'—J. W. Cockle.

'Armstrong, B.C., August 18.—I notice the chrysalids from the cutworms in constantly increasing numbers among my potatoes.'—Donald Graham.

'Agassiz, B.C., August 18.—The cutworms are gone, but the potatoes, mangels and peas have been seriously injured. In some cases, as the mangels, our crop is destroyed. The peas were lessened 50 per cent, and potatoes are defoliated to a considerable degree, but the absolute injury will not be known until they are harvested.'—Thos. A. Sharpe.

'Chilliwack, B.C., September 3—Cutworms have been devastating our pea crop and roots. However, I have only lost about 15 acres of peas, so I consider myself lucky; but some of those I have got harvested are shrivelled and very small.'—G. Maxwell Stuart.

'Okanagan Mission, B.C., August 20.—Caterpillars did a great deal of damage here this year, but copious irrigation proved a pretty good method of controlling them.'—J. T. Davies.

In summing up the insect injuries of the year in British Columbia, Mr. R. M. Palmer writes, as follows :—

'Amongst insect pests occurring during the year the Variegated Cutworm has made a record of damage far exceeding anything known in the province. You have so much data from Mr. Anderson on this that it is unnecessary for me to deal with the matter at length. The crops which suffered most severely were potatoes, tomatoes, cabbage and allied plants, peas and clover. The cutworm seriously injured the apple crop in some districts, and also defoliated or cut off many young shoots of fruit trees. To prevent the cutworms from climbing the stems of fruit trees, banding them with a strip of the common sticky fly paper proved very effective, and when the Paris green and bran mixture was deposited near the base of the trees, immense numbers of the pests were destroyed. A capital plan in using the poisoned bran for this purpose, is to cover the mixture with pieces of sacking or other material, under which the cut-

worms collect, and feed—while poultry and other birds are prevented from getting the poisoned bran—a very important matter.

'There is no doubt that much of the loss caused by the cutworms could have been prevented by timely use of Paris green, but the plague was so unexpected, much valuable time was lost before farmers generally woke up to what was going on, and when the fight was fairly started, unfortunately the supply of Paris green was not equal to the demand.

'The wide circulation given by Mr. Anderson to your letters containing information as to ways and means of fighting the cutworms was much appreciated, and the methods advised were adopted generally.'

The following epitome of this remarkable occurrence of a common native species was written by Mr. Anderson at the end of the season, and will be read with interest :

'Victoria, December 3.—Regarding the cutworm outbreak which occurred in this province last summer it might appropriately be characterized, on account of its suddenness, extent and the myriads of individuals, as a veritable plague. I have not been able to ascertain how far south and east the plague extended, but it may safely be said that the States of Oregon, Washington and Idaho, and the whole of the province of British Columbia, as far north as any reports were obtainable from, were infested. The first report to this department was made by Mr. Tom Wilson, in the middle of July, he stated that the potato tops on Lulu Island were being devoured by some insect, but which, in spite of diligent search, could not be detected. Suspecting the cause, I advised looking for the culprit at night with lanterns, this was done with the expected result. Not suspecting the infestation to be widespread, I merely recommended the treatment usually followed. However, a few days later reports began pouring in from all parts of the province and bulletins were issued from time to time recommending the remedies you prescribed in your reports. The sweetened bran poisoned with Paris green, when it was used in accordance with directions, was found to be most effectual.

'Unfortunately, the supply of Paris green, not only in this province but in the adjoining states and California, was not equal to the demands, in consequence of which great havoc was wrought before a supply could be received from the East. When at length a supply was obtained, many of the caterpillars had passed into the chrysalis stage. The numbers of the caterpillars were simply incredible ; in places the surface of the ground was described as a moving mass, and where they were poisoned in any numbers the stench was unendurable. On account of their numbers and the consequent scarcity of food, they soon relinquished their natural nocturnal and non-climbing habits, and myriads could be seen crossing the dusty roads in the heat of the day in search of food ; fruit trees, if not protected, were ascended, and the fruit as well as the leaves consumed. Naturally, green succulent food was first consumed, but, as that got scarce, anything and everything was attacked ; after consuming the tops of potatoes, turnips, onions, carrots and such things, the tubers were attacked. Potatoes which were well matured and those which were quite late, escaped with the least loss ; carrots and onions suffered very severely. The potato crop was probably reduced one-third, and other root-crops in proportion. The second crop of clover was almost entirely destroyed. Grain was attacked, but no material loss resulted.

'In August the caterpillars began to enter the chrysalis stage, and their ravages began then to be, of course, much lessened. Altogether, the period of activity lasted about from six weeks to two months. A number of caterpillars which I had in captivity were all in chrysalis by the end of August or the beginning of September. A number of these emerged as moths in October, but I have not been able to discover any eggs. A large number of the moths were also caught in the grass-cutters used on the lawns surrounding the government buildings here. My observations have led me to the following conclusions, viz.: That the cutworms appeared in such abnormal numbers owing to the scarcity or absence of their natural enemies, parasites, birds, &c.; that where fowls were allowed to roam the plague was reduced to a minimum ;

that poisoned bran when used as directed is most efficacious; that parasites are increasing and will probably reduce the numbers of cutworms next season; that from good services rendered in devouring great numbers of these cutworms the crow frequently so destructive to potatoes and other crops in this province, has this year done the farmers good service.'—J. R. ANDERSON.

* Fig. 12.—Variegated Cutworm: moth—twice natural size.

DESCRIPTION OF THE INSECT.

The moth, which is the parent of the Variegated Cutworm, is a large species expanding from an inch and a half to nearly two inches when the wings are spread. It varies very much in colour; the forewings are, as a rule, rather dark brown, but varying to ochreous or russet-brown, shaded on the disk and toward the end of the wing with darker brown; occasionally specimens are quite light along the costal region and at the base of the wing. The wings are crossed by the usual four more or less distinct double wavy bands, but in many specimens these merely show as double spots on the costa. The reniform or kidney-shaped spot is usually darker than the orbicular or round spot, and the reniform bears a few white scales on the outer margin. In two specimens no trace of the reniform or of the orbicular can be seen. The underwings are pearly-white in the centre, with a purplish sheen, bordered broadly and veined with dusky brown, and fringed with white (hence the English name of this moth, The Pearly Underwing). The thorax is of the same colour as the forewings, and bears in the centre a tuft of raised light-tipped scales.

The eggs are laid in elongated flat patches, and were first found by Dr. Riley and figured in his First Missouri Report for 1868. In years of great abundance it is probable that these eggs are laid in various places other than on the food plant. Eggs which were most probably of this species were found upon curtains, on clothes hanging on lines, and on the woodwork of houses, by Mrs. Walton, of Armstrong, B.C., and Mrs. Place, of Dog Creek, B.C. On hatching, the young caterpillars, as is the case with some other cutworms, are loopers, and resemble the larvæ of the Geometrid moths, lacking some of the prolegs which appear in later stages. A full account of the appearance of the larva in the different stages is given by Dr. Lintner in his Fifth Report as State Entomologist of New York.

---

* Figures Nos. 9 and 11 have been kindly lent by Prof. Otto Lugger, and Nos. 10, 12, 13 and 14 by Prof. M. V. Slingerland.

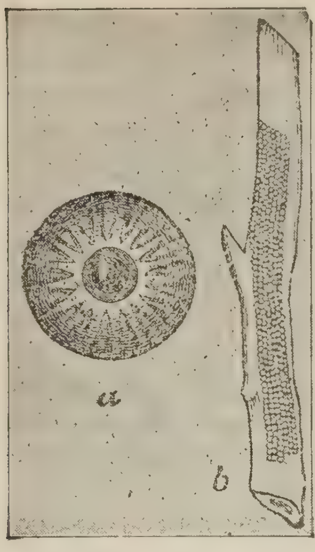


Fig. 13.—Variegated Cutworm : eggs.

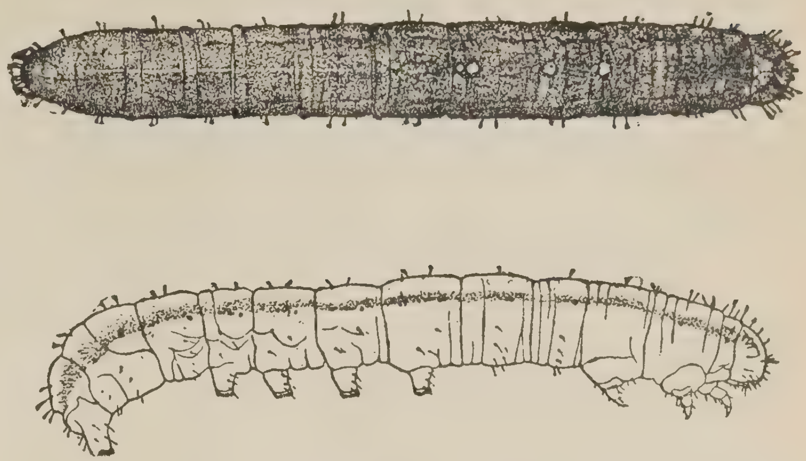


Fig. 14.—Variegated Cutworm—enlarged one-half.

The following is a description of the full-grown larva, the form in which it appeared as such a destructive enemy among the crops of British Columbian farmers and gardeners last season :—

Heavy-bodied cutworms, about two inches in length by over a quarter of an inch in width, of varying shades of gray or stone colour, the whole body finely mottled and variegated with black, gray, brown, or pinkish markings, any one of which may predominate more or less in different specimens ; many have a ruddy appearance from the ground colour of the skin being of a pinkish colour. The markings of these caterpillars consist of a conspicuous yellow band, mottled with orange, beneath the spiracles; a sub-dorsal interrupted stripe of velvety black blotches washed with orange, sometimes very conspicuous, but at others almost obliterated ; a medio-dorsal line of yellow, almost continuous from the head to the apex of the anal flap. This line expands into four or sometimes five conspicuous yellow spots, situated in the centre of the middle segments. These spots are always present on segments 4 to 7, those on 5 and 6 being the largest. There is also occasionally a spot on segment 3. The supra-stigmatal area bears on each segment, except the head, a diagonal blackish, curved, almost S-shaped mark, the lower end of each of which incloses the black spiracle. These marks form a wide, but on some specimens distinct, sinuous band between the sub-dorsal stripe and sub-stigmatal band. On segment 12, the sub-dorsal stripes meet and form a black velvety patch, somewhat like the letter W, with the lower part filled in. Behind this, on segment 13, and the posterior third of segment 12, is an orange or pale patch, sharply defined anteriorly against the straight edge of the velvety patch on segment 12. The ventral surface is paler than the dorsal and glaucescent. Head round, deeply cleft at summit, testaceous, coarsely mottled with brown or reddish markings. In the centre of the face are two curved black stripes which, starting from the summit of each lobe of the head and converging, meet above the frontal triangle, and then run down to the base of the antennæ. Thoracic feet testaceous ; prolegs concolorous, bearing testaceous chitinous plates at the base exteriorly ; claws blackish.

When full-grown, these caterpillars burrow a short distance into the ground and form a smooth oval cell, in which they change into the chrysalis or pupal stage, when they are of a bright chestnut brown, about three-quarters of an inch in length. The anterior segments following the rounded head parts and to the tips of the wing covers, are cylindrical, but the six remaining segments, as has been noticed by several correspondents, are capable of movement. These segments diminish in size to the tip, which is armed with two slender black spines, which lie so close together as to appear as one, unless closely examined with a magnifying glass. This stage for the second brood, of which the moths emerged in August and September, was from 20 to 23 days.

There is no doubt that there are two broods of this moth in Canada, as was stated to be the case by Dr. Riley, in Missouri, many years ago. The moths of these two broods appear normally about the end of June and after the middle of August ; but it seems as if some individuals of this latter brood may be delayed in emergence till late autumn, or even till the following spring. Prof. Otto Lugger writes that he has taken this moth so frequently at St. Anthony Park, Minn., very early in the spring, from March 2 to 27, that he feels almost certain that at least some of the moths may hibernate as such. He has also found them very late in autumn, after all foliage had disappeared from plants. In fact, he finds such irregularity in the appearance of this species, that they can be obtained almost throughout the season. On November 9 last, I dug up at Ottawa two pupæ which produced the moth ten days afterwards indoors. This was nine days later than the date when the ground was covered with a fall of snow, which has remained ever since, and will in all probability be here until next spring. Therefore, had these pupæ not been found, the moths could not have emerged from them until next year, showing that the species sometimes hibernates as a pupa ; but a large number of the moths, by far the largest of those reared this year, appeared by the third week in August, and it seems probable that with this species, as with a great many other cutworms, egg-laying would take place by the end of August and the beginning of September, that the young larvæ would hatch and make part of their growth before winter, or even, as in the case of *Carneades ochrogaster*, Gn., that the eggs might remain unhatched until the following spring ; it would thus appear, from the very diverse dates at which the perfect moths and caterpillars have been found, that this species may pass the winter in almost any stage, and this is doubtless the case with a great many other species, the life histories of which have not been perfectly worked out. An excellent article on the Variegated Cutworm has been published by Prof. Slingerland (Bull. 104, Cornell Agric. Exp. Stn., 1895.)

The most important facts with regard to the insect are the class of crops which are likely to be injured by it, and the best remedies with which to prevent its injuries. As to the range of its food plants, the extracts given above indicate pretty well that almost any vegetation is acceptable.

Professor French, in the Seventh Report of the State Entomologist of Illinois, says: 'The Variegated Cutworm is widely distributed, and it is probable that we have no other species that is more voracious or is a more general feeder. While some kinds of cutworms are not found much out of certain situations, this may be sought in any place during its season with a good prospect of finding it. There seems to be no cultivated crop that is free from its attacks, and when these are not at hand, it readily preys upon weeds that are found in fields and by the roadsides.'

Remedies.—The remedies for cutworms have been given so frequently in former reports that it is hardly necessary to repeat them in full here. Briefly, they consist of:

(1). The banding of freshly set-out annual plants with rings of paper or tin.

(2). The poisoning of the caterpillars either with traps of fresh vegetation tied in bundles and, after being dipped is a mixture of Paris green and water, or other poison, distributed at short intervals over infested land, when the cutworms appear. A modification of this remedy which has given the greatest satisfaction in British Columbia during the past season, is known as the poisoned bran remedy. This was first used successfully on a large scale some years ago in California as a remedy against grasshoppers in vineyards, since which time it has come more and more into use, owing to its efficacy and the ease with which it can be prepared and applied. This mixture consists merely of bran, moistened with sweetened water, and Paris green, mixed in the proportion of 1 pound to 50 pounds of bran. In making this mixture, the most convenient method is to dampen a small quantity with the sweetened water, a few ounces of sugar in a pail of water, and then add more dry bran until the whole is almost dry again. If the Paris green is added to the bran without

dampening it, it sinks with remarkable rapidity to the bottom, even in this dry mixture, when it is stirred. If it is desired to use the poison as a wet application, more water can be added until it is of about the same consistency as porridge ; but if to be used dry, dry bran must be stirred in until the mixture will run through the fingers easily. This poison may then be applied to the land, either around or between plants to be protected, or a row of it may be run close to the drills of crops planted in that manner.

PARASITES.

The valuable aid rendered by parasites, whenever any injurious insect appears in unusual numbers, is so well known that the practical entomologist is always on the alert to detect if these are present during an outbreak of an injurious species, such as occurred in the case of the Variegated Cutworm in British Columbia during the summer of 1900. That these were present in some numbers was proved, but they seem to have been local in their distribution. They are, however, difficult to detect, and it is to be hoped that they may have been overlooked in many instances. At Nanaimo they were looked for carefully but unsuccessfully by the Rev. G. W. Taylor, an experienced entomologist, and he is of the opinion that there may be trouble again in that locality next year. The experience of the past with regard to similar outbreaks would, however, seem to justify a more hopeful view of the case. Cutworms of all kinds have many enemies, both parasitic and predaceous, and these increase with remarkable rapidity, so that two successive years marked by such an outbreak as was experienced this year would be almost without precedent. Not only will parasitic and predaceous insect enemies, and fungous and bacterial diseases have increased, owing to the large food supply, but many insectivorous birds and domestic animals, having learned how to find them, will be ready to assail them next year on their first appearance. The phenomenal abundance of the Cutworms and the widespread injury they wrought has forced farmers and gardeners to learn their habits and acquaint themselves with the most practical remedies. The following are a few extracts from correspondence bearing on the subject of the natural enemies of the Variegated Cutworm in British Columbia.

'Nanaimo, August 13.—I have boxed up a couple of hundred caterpillars of *saucia* for the sake of breeding parasites ; but they seem remarkably healthy, and I have not seen a single one attacked by Tachina Flies.'—Rev. G. W. TAYLOR.

'Victoria, August 17.—I send larvæ of what I take to be a parasite. The man who brought them to me said he put cutworms only into a jar, and on looking at them a few days ago, he found one dead one, killed, I think, by parasites, two chrysalids and these larvæ in an earthen hollow which had, I think, been inhabited by the host.' —J. R. ANDERSON.

'Victoria, August 3.—You will be pleased to learn that some of the caterpillars are parasitized by ichneumon flies, and it is reported to me from Salt Spring Island that "white eggs" (Tachina eggs ?) are on many of the cutworms near their heads.'—R. M. PALMER.

'Victoria, August 17.—Three lots of larvæ which I had under observation, were almost all destroyed by the maggots of a parasitic fly, no doubt the same species as you found in your Victoria consignment of larvæ. Field investigations show the parasites to be well distributed.'—R. M. PALMER.

'Vancouver, August 20.—I saw in a recent letter in the papers (with reference to cutworms) that you state that cutworms turn to moths. In going over a farm near here, I picked up a number of chrysalids, among others one that was just bursting, in fact the insect was partly out ; it was not, however, a moth, but a large black fly, and seemed to pretty well fill the chrysalis. The fly was not unlike a black flying ant, but with very long legs, in fact a sort of cross between a flying ant and a hornet. It had a small sting apparently. Is this a parasite of the cutworm ? I have frequently

seen these flies in the gardens and on the farms. There are a great many about just now.'—C. E. Hope.

This last important observation evidently refers to an Ichneumonid parasite. The larvæ sent by Mr. Anderson produced *Meteorus vulgaris*, Cress., a well-known parasite of all kinds of cutworms, and the flies mentioned by Mr. Palmer, as reared at Ottawa, from caterpillars sent from British Columbia, were the large muscid the Cattle Fly (*Muscina stabulans*, Fallen), of which no less than 17 were reared from one sending of caterpillars from Victoria.

'Nanaimo, August 27.—*P. saucia* is now coming out of the pupa state in considerable numbers. So far as I can see in this district, the parasites have not done very much for us. I have only seen one caterpillar attacked by hymenopterous parasites, and only a very few by diptera. Many caterpillars, however, have shrivelled up in the pupal cell without changing.'—Rev. G. W. Taylor.

Several correspondents mentioned finding the caterpillars dead on the ground, or in the cavity made in the ground by the cutworms, before turning to pupæ (or chrysalids). Some of these were sent by Rev. G. W. Taylor, who had found them in considerable numbers at Nanaimo. These were forwarded to Dr. Roland Thaxter, at Harvard University, in the hope that a parasitic fungous disease might have been discovered, but unfortunately no fungus could be detected. Dr. Thaxter writes: "I looked at the *saucia* larvæ soon after receipt, but found no sign of fungus. It is possible that it may have been bacteriosis, but it would be impossible to determine this from the material. Such cutworms are subject to *Empusa aulicae*, and I have no doubt that if careful investigation were made during one of these invasions, this or some other *Empusa* would be found destroying them.'

PREDACEOUS ENEMIES.

Wild birds were occasionally spoken of as destroying these caterpillars, but as a rule the kinds were not specified. Robins are mentioned by Mr. Dashwood-Jones, and the following letter is from Mr. J. R. Anderson :—

'Victoria, August 15.—'I am sure you will be pleased to hear a good word spoken in favour of the execrated old Crow. For some time before it was discovered that the cutworm plague was upon us, I noticed first one, then several, and then a large number of crows busily engaged among the grass on the lawns in front of the Government buildings. On investigation I discovered that they were after the cutworms, and good work they must have done judging from the assiduity with which they pursued their labours. I have since had similar reports from several parts of the province, and even the still more execrated Blue Jay has come in for a good word from some quarters. The old adage is borne out that a certain gentleman is not always as black as he is painted.'

Chickens and ducks are mentioned by several observers as having done good work. The following are among the most interesting records :—

'Victoria, July 30.—I saw a remarkable thing yesterday. There were two gardens close together with the same kind of soil, &c. One was beautiful, the other was eaten bare by cutworms. Chickens had the free run of the first, in the other there had been no chickens. In small gardens there would have been very little trouble in keeping them clean.'—G. A. Knight.

'Victoria, July 28.—I turned the chickens into the garden, giving them water, but no wheat, and they are working at the caterpillars all day, but cannot get rid of them all ; they are in thousands, every handful of soil is full of them. Ducks seem to eat even more than the chickens, but want some one with a rake to bring the worms to the surface.'—J. W. Webb.

Pigs were very useful at Agassiz.

'August 6.—I intended to put down some poisoned bran, but I found nine of my young pigs in the potato field, travelling regularly up the furrows, just moving

the earth sufficiently to get at the worms. In no case did I find the potatoes uncovered or touched; from the look of it, the pigs must have been at this work for some days. They are about 5 or 6 weeks' old, and seem to have lived mostly on these worms. They have eaten nothing in the sty, except from the mother, until the last 2 or 3 days, and they are perfectly fat. I knew they ate a lot of raspberries, but could not see how they got so fat on them. The potato field joins the pig field, and it is my intention to turn the pigs in as soon as I have lifted the potatoes.'—WILLIAM S. JEMMETT.

As there is a possibility that the Variegated Cutworm may again appear in British Columbia next season, it will be wise for every one to be keenly on the lookout for its first appearance in any form, and to write and send specimens promptly to the provincial Department of Agriculture in Victoria, or to this Division, so that advice may be given as to the best steps to take under the circumstances to prevent loss. Observations on the occurrence of parasites, and predaceous insects, and of work done by wild birds, poultry, pigs, &c., will be of special interest, and I shall be greatly indebted to any observers who will report to me any instances which may come under their notice.

THE SPOTTED CUTWORM

(*Noctua c-nigrum*, Linn.).

Among the outbreaks of cutworms reported to this Division during the season of 1900, mention may be made of one which occurred in Ontario just at the same time that the Variegated Cutworm was doing so much damage on the Pacific coast. Injury was reported from Niagara and several places north of Lake Ontario. The moth was also extremely abundant at Ottawa from July to the end of the summer. Almost all kinds of vegetation, with the exception of the various grasses, were attacked, and the larval habits of this species seem to resemble very closely those of the Variegated Cutworm. Young larvæ in the looper stage were received from Niagara, from Mr. Joseph Healey, on June 13, who had found the cluster of eggs upon an apple tree and the larvæ were reared to maturity upon the leaves of that tree. Pupation continued from July 24 to 27, and the moths all appeared from August 18 to August 25. The following extracts refer to two of the worst occurrences reported:

'Whitby, July 25.—Upon examining some tomatoes to-day, the fruit of which is not more than half grown, I discovered that, with scarcely an exception, the tomatoes were more or less eaten by greenish coloured grubs, the largest of which were a little over an inch long, some being quite small. They ate through the skin and then consumed the inside. There were a number, a dozen or so, in each tomato. The plants are healthy and vigorous, the foliage not being affected. There are thirty or forty plants in the patch. Every one I examined was in the same condition. The grubs are not very active. As the matter may be of economical importance, I thought it would be well to let you know about it at once. It may, of course, be only a casual invasion; but, should it spread and become general to the extent that this patch of mine is affected, it will prove a serious matter for tomato growers.

'Since writing the above I have learned from my man that there were a large number of these same grubs in a patch of oats and peas growing alongside of the tomatoes, and that on a nearby farm there were immense numbers in a field of peas. Some cauliflowers growing near my tomato plants are also being visited.'—W. O. EASTWOOD.

'July 30.—As requested I send you some of the grubs from my tomatoes. My man tells me that, upon pulling up some of the affected plants, he found bunches of the grubs an inch or more below the surface, also that they are thick in a field of peas about half a mile from here.'—W. O. E.

'Pefferlaw (York Co.), Ont., July 30.—I send you by mail a box of worms which are abundant on the farm of Mr. James Cornwall, of Georgina township. They have

stripped a field of carrots and mangels. They devour the leaves of Canada Thistle, gooseberries, choke-cherries, &c. A field of oats beside the carrots is untouched. About eighty rods away, on the farm of Mr. W. Jackson, they have devoured a field of peas. After eating the leaves of the mangels they attacked the roots and ate large holes in them. They can be dug out of the ground around the carrots and mangels in large numbers. Kindly tell me what they are and advise a remedy.'—THOMAS CORNER.

Like the Variegated Cutworm this is a double-brooded species and is never a rare insect ; but this year it was exceptionally abundant. It was the second brood, the larvæ of which are found in July, which was so destructive this year.

The following is a description of the full-grown larva of *Noctua c-nigrum*, the Spotted Cutworm.

Length, about one and three-quarters inches, by slightly less than a quarter of an inch in width. The markings of this caterpillar are in a general way very similar to those of *Peridroma saucia*, except that the mottlings are finer and less distinct, thus by contrast making the bands and stripes more prominent. The medio-dorsal line is continuous and not expanded into the yellow spots so characteristic of the Variegated Cutworm. The black velvety blotches of the sub-dorsal stripe are more clearly defined, and the posterior extremities do not meet on segment 12 in the black W-shaped blotch of *P. saucia.* The black blotches of this line are all separate and decrease in size anteriorly, and each one bears in front of it, lying towards the centre of the dorsum, a pale blotch, behind which in the centre of each segment is a smoky shield-shaped blotch. These markings give a much more checkered appearance to this caterpillar than is the case with the Variegated Cutworm. The sinuous band between the infra-stigmatal band and sub-dorsal stripe is also shadowed above with pale blotches. The ventral surface is conspicuously paler than the dorsal. This caterpillar as compared with the Variegated Cutworm is more slender, shorter, and the colour is, as a rule, ruddier, the mottlings much finer and the black marking more contrasted with the ground colour.

These caterpillars when full-grown burrow into the ground and form a cell in the same way as the Variegated Cutworm. The length of time from the hatching of the eggs until the caterpillar is full-grown is about six weeks in summer. The hibernating larvæ begin feeding in April and produce moths by the end of May or early in June. It has been noticed, however, by Dr. Forbes, in Illinois (Ill. Agr. Exp. Stn. Bull. 60) that a few are said to continue much longer in the pupal stage, even as late as August. This retardation of development is a common feature with many insects, of all orders, and is doubtless a provision of nature as a means towards the preservation of species.

The moth of the Spotted Cutworm, which, from the markings on the forewings, has been called the Black C Rustic, is a rather showy moth of about an inch and a half in expanse of wings. The forewings are, as a rule, purplish brown, sometimes almost black, in the females, and much paler in the males. There is a black C-like spot in the middle of the forewing, the open part towards the front edge of the wing, and filled with a much paler blotch, which extends beyond the C-like spot and merges with the general colour of the wing. There is great variation, however, in the shade and intensity of the colouring, specimens of both sexes being lighter or darker than the average. The hindwings are dusky, paler towards the base, and of a satiny lustre. The thorax is of the same colour as the forewings, with a distinct pale collar.

The remedies which are recommended for the Variegated Cutworm on a previous page will be found applicable to this species also.

There were but few parasites noticed among the caterpillars sent with the above letters, but upon one larva three curious egg-like bodies were observed, which proved to be the larvæ of a small hymenopterous parasite, which has been identified by Mr. W. H. Ashmead, of Washington, as *Euplectrus frontalis*, How. These parasitic larvæ were oval, like minute white eggs, at first, but later were attenuated posteriorly and about one-twelfth of an inch in length. They were attached to the back of the cater-

pillar, close to the head, and only relaxed their hold when full-grown, to spin their light silky cocoons among the leaves close to the dead body of the caterpillar, which they had destroyed.

THE CABBAGE PLUSIA
(*Plusia brassicae*, Riley).

Fig. 15.—The Cabbage Plusia: *a*, caterpillar; *b*, cocoon; *c*, moth.
(Cut kindly lent by Dr. S. H. Forbes.)

This insect is frequently a serious enemy to the market gardener in the United States; but I have never received a complaint concerning its work in Canada until the present year. This has been a matter of some surprise to me, because it has been the cause of much loss in States of the Union close to our boundaries, both in the East and in Minnesota. In July last, specimens of the caterpillars were sent in from the North-west, and moths were taken at Ottawa and St. John, N.B., for the first time.

'Regina, Assa., July 18.—The caterpillars I send have been doing some damage in gardens here. I observed them first on potatoes about three weeks ago; they ate small round holes in the leaves. They have since turned their attention to lettuce. In my own garden they ate a row of green lettuce right to the ground before I found out what was the matter. They have since got into the bronze variety; but do not appear to devour it so voraciously as the other. I have found them in a neighbour's garden eating the leaves of celery much in the way they attack potatoes. The colour of the caterpillar is a bright, rather blue, shade of pea-green, somewhat whitish along the back. It is very lively, especially when small, and when disturbed rolls itself into a ball. Some of the caterpillars are now spinning their cocoons in the lettuce leaves. Please let me know what species it is, and what remedy to apply.'—J. R. C. HONEYMAN.

The Cabbage Plusia, also known as the Cabbage Moth, and, in the caterpillar form, as the Cabbage Looper, is said to be, where it occurs, the worst pest known on lettuces grown in forcing houses. It would appear as though this insect were becoming year by year a worse pest, and that the area where it occurs as an injurious insect is enlarging. It may be that before long we may, in Canada, have to reckon with this insect as a regularly recurring enemy.

The most practical means of preventing the work of the caterpillars on lettuces in forcing houses is stated to be the keeping of the ventilators closed with mosquito netting. It is thought that the eggs are sometimes laid on plants before they are taken into the houses, but probably the moths gain access to forcing houses more generally through the ventilators. There are many other plants in greenhouses which are attacked by this caterpillar. In the autumn they have been found troublesome among chrysanthemums, cutting off the flower buds. Smilax and other plants have also been injured. In the open ground the caterpillars are most destructive to cabbages and related plants, such as have smooth leaf surface. They feed on the surface of the

leaves, and are said by Mr. Sirrine to be much more particular about what they eat than is the case with the imported Cabbage Worm. They walk rapidly, and, if they find any foreign substance on the leaves, they move off to other parts of the plant.

The caterpillars are pale green, striped with longitudinal whitish lines. The body of these caterpillars is shaped differently from most of the common noctuid caterpillars found in gardens, in that it increases gradually from the head to the last segment, where it is largest and slopes off abruptly. Another noticeable difference between the caterpillars of the Plusias and other noctuid caterpillars, is the fact that they have only two pairs of prolegs instead of four. There are several species of these insects, but none have ever proved very troublesome in Canada. In 1884, the Cabbage Plusia was very destructive in the State of Minnesota, almost equalling the injuries of the common Cabbage Worm *(Pieris rapae*, L.). Dr. Forbes states (Ill. Agr. Exp. Stn. Bull. 60) that the larva feeds on celery, kale, turnip, tomato, lettuce, mignonette, dandelion, dock, clover, lamb's quarters, and some less common cultivated crops. It ranges through the United States and occurs also in Canada. The eggs are laid upon the food plants, singly or in small clusters The larva spins a gauzy cocoon among the leaves. The pupa is light yellowish brown in colour. The moths are very dark, the upper wings being almost black or very dark gray, marked with small white points and indistinct bands, and having a silvery U-shaped spot on the middle of the forewing, and a smaller round silvery dot close to it on the outside. There seem to be two broods of this insect in Canada.

It has proved to be a difficult matter to destroy the caterpillars of the Cabbage Plusia upon cabbage and lettuce crops. Mr. F. A. Stirrine (N.Y. Agr. Exp. Stn., Bull. 144) tried many experiments with remedies, and found that a soap wash containing arsenical poisons proved the most useful. He speaks of this as a resin-lime mixture and gives the best formula for its preparation. The estimated cost for preparing and applying this remedy is $2 an acre.

THE SAN JOSE SCALE

(*Aspidiotus perniciosus*, Comsk.).

This insect continues to receive the keenest attention from practical entomologists in all parts of North America, and most careful experiments have been carried out in the endeavour to find any treatment which will control the scale without injuring the tree. At the present time crude petroleum and whale-oil soaps (caustic potash fish-oil soaps) seem to give the greatest promise in this direction. With regard to crude petroleum, more experience seems to be necessary before a definite recommendation can be made as to the strength and manner in which it can be safely applied. Mr. George E. Fisher, the chief Inspector for San José Scale for the province of Ontario, has experimented extensively during the past summer with both of the above-mentioned materials, and the results of this work, which he presented in an important address before the Entomological Society of Ontario, at the annual meeting in November last, may be summarized as follows :—

Fig. 16.—San José Scale; apple branch with scales ; large scales above at left.

Whale-oil soap, at a strength of two pounds to one gallon of warm water, killed many scales; but in no case was complete success obtained, however carefully the work might have been done. The trees, nevertheless, were in most cases benefited by the application. The scale was reduced to the

greatest degree on cherry trees, and aphids were quite destroyed. Even when trees were in blossom, no injury from the soap was noticed. The treating of trees with the whale-oil soap did not prevent the young scales from settling soon afterwards on the parts treated.

Crude petroleum gave better results as far as the scale was concerned. A mechanical mixture of water with 30 per cent crude petroleum could be used quite safely on apple trees, and also with care upon plum and peach trees ; even this, however, was not a perfect remedy, as all the trees treated had some scale upon them at the end of the season. Mr. Fisher considered that a combination of whale-oil soap and crude petroleum would probably be found the best remedy. He did not think it safe to recommend crude petroleum for general use. The ordinary fruit grower would not use even the whale-oil soap in accordance with instructions, and he felt sure they would use crude petroleum in the same careless way, and trees would be killed. He believes that a frequent cause of injury from crude petroleum when applied with water is that operators when spraying, go over trunks and other parts of trees twice ; beginning on the trunk, they go over the tree and finish up again on the trunk, thus depositing two applications or twice the necessary quantity of oil, because the water evaporates quickly but leaves the oil on the tree. Imperfect work is frequently done from the difficulty of reaching the upper side of the high branches on the opposite side of a tree which is being sprayed. The best time to apply the spray, whether of soap or of crude oil, is in April.

A word of warning may be here inserted for the benefit of those who may wish to use crude petroleum with regard to the variation in the specific gravity of crude petroleum from different wells. Dr. J. B. Smith, who has certainly done more to test the value of this remedy than anyone else, says (New Jersey Bulletin, 146), after giving the specific gravity of several samples :—

'Thus thirteen samples register 50° or over, leaving 70 that run between 40° and 49°, the majority running nearer to 46° than to 44°, both in green and in amber oils. It is a fair requirement, then, for a straight crude petroleum that it should have a specific gravity of 43° or over, at a temperature of 60° Fahr.; anything less might be harmful; anything more than 45° is unnecessary.

The importance is thus shown of knowing what the specific gravity by the Baumé oil scale is before any sample is used by a fruit-grower upon his trees.

The San José Scale exists in Canada only over a small area of the province of Ontario, extending from Niagara around the western end of Lake Ontario as far as Burlington and westward through the counties bordering on Lake Erie, and, even in that area, although it is true that the scale has increased considerably during 1900, the outside limits of this area have not been extended, and it is only in certain orchards where the insect occurs. In addition to this the majority of the owners of these orchards understand now the danger of neglecting to treat their trees, and are adopting vigorous measures to control the pest. The area may be described in general terms as that part of Ontario where the peach can be grown commercially. All reports of the occurrence of the San José Scale in other provinces are erroneous. The only other province where it has ever been found living on trees, is British Columbia ; this was some years ago, and Mr. R. M. Palmer, the official Inspector of Fruit Pests, expressly writes on this subject :—

'Victoria, B.C., November 21.—You will be glad to know that there is no San José Scale in the province. Reports of the presence of this dreaded pest from Salt Spring Island and Cowichan district, upon investigation, proved to be unfounded. The "scare" arose from the fact that many apples affected with the "leaf-spot-fungi" developed a red-spotted appearance somewhat like the discoloration of the fruit caused by San José Scale.'—R. M. PALMER.

An important step with regard to this insect was taken by the Hon. Minister of Agriculture last spring in putting through an amendment to the San José Scale Act, by which under certain restrictions nursery stock was allowed to be imported

into Canada from countries where the San José Scale was known to occur. When it was discovered that this insect could be killed on nursery stock by fumigating with hydrocyanic acid gas, at the urgent request of many fruit-growers, horticultural societies, nurserymen and others, by instruction of the Minister of Agriculture, proper fumigating houses were erected last spring at such points on the boundary as it was thought would be most convenient to importers, and qualified superintendents were appointed to treat any nursery stock, trees, shrubs or other plants as might be imported through these ports, and then repack and send them on to their destination as promptly as possible. For this fumigation with hydrocyanic acid gas the formula recommended by the United States Entomologist for dormant stock was adopted, it being the simplest effective formula, viz. : one fluid ounce of commercial sulphuric acid, one ounce of refined cyanide of potassium (98 per cent), and three fluid ounces of water to every 100 feet of cubic space—exposure 45 minutes. These fumigating houses were located at the customs ports of St. John, New Brunswick; St. John's, Quebec; Niagara Falls and Windsor, Ontario; Winnipeg, Manitoba; and Vancouver, British Columbia. The whole expense of these stations was assumed by the Dominion Government, but all shipments were made entirely at the risk of the shippers or consignees, the government assuming no risk whatever. The packages had to be addressed so as to enter Canada at one of the above named ports of entry, and the route by which they were to be shipped, clearly stated upon each package.

Many horticulturists and nurserymen availed themselves largely of this concession, and at every port much stock was imported from the United States and Japan. Nursery stock of all kinds can be imported from Europe without fumigation, as the San José Scale has never gained a foothold in European countries. Certain other plants which are not liable to the attack of the San José Scale are also exempted from treatment under the San José Scale Act. These are: (1.) green-house plants, including roses in leaf which have been propagated under glass; (2.) herbaceous perennials, including strawberry plants; (3.) herbaceous bedding plants; (4.) all conifers ; (5.) bulbs and tubers.

The fumigating houses were kept open with a superintendent constantly in attendance throughout the seasons of spring and autumn shipments of stock. Owing to the lateness of the season at which it was decided to do this work, the fumigating station for British Columbia was not operated until the autumn season of 1900, and, as all vegetation is much earlier in Oregon and Washington States, from which most shipments are made into British Columbia, it has been arranged that for that province the fumigating house shall be kept open for the winter months from October 15 till March 15. For Manitoba and the Eastern Provinces the spring season is from March 15 till May 15, and the autumn season from October 7 till December 7.

The San José Scale, although only occurring as stated above in a comparatively restricted area in the province of Ontario, has increased considerably in orchards which were infested last spring and other orchards adjacent to them. Nevertheless, the condition of orchards even in the area where trees are liable to become infested, is by no means hopeless. The Ontario Government has expert, capable and wise officials devoting their best energies to the discovery of a practical remedy ; and, although, from the lack of knowledge on the part of some fruit-growers, the work of controlling the San José Scale has been much hindered by the suspension of remedial measures in 1899, at the same time, the results of experiments show that much good can be done by treating orchards if this is done systematically. This treatment, however, in the present state of our knowledge, is both dangerous and rather expensive; but the former of these drawbacks will most probably be lessened or done away with by future experimenting, and the question of expense is merely a business matter of comparing outlay with returns, the same as has to be met in every branch of a fruit-grower's or any other business man's work. It is merely a question of whether the treatment pays or whether it does not. If it can be shown that a certain expenditure of money and labour will bring a profitable return, that is all the business man has to consider.

As an illustration of this, it will be worth the while of all fruit-growers living in that part of Ontario where the San José Scale occurs, to acquaint themselves with the actual facts of the present condition of Catawba Island, Ohio, in Lake Erie. A year or two ago this island was practically one large and very prosperous peach orchard. Later the San José Scale was imported and increased to the extent that the fruit prospects of the whole island were thought to be ruined. The natural excitement caused by this state of affairs stirred up the whole fruit-growing community to the adoption of energetic measures. By the advice of Prof. F. M. Webster, whale-oil soap was adopted as the universal remedy. Arrangements were made with Mr. W. H. Owen, of Catawba Island, to make a uniform grade of whale-oil soap, and this was applied to the trees throughout the island. As a consequence of this work, a large crop of fruit has been reaped from Catawba Island, where but for this concerted action only devastation and ruin could have existed. It must not be forgotten, however, that this action by the fruit-growers was almost universal, and nearly every orchard was sprayed regulary and at the time advised. Now, Prof. Webster expressly states that the San José Scale on Catawba Island is by no means exterminated, but that the fruit-growers have got it under control by a persistent use of whale-oil soap. They have simply reduced the pest to a point where it can be controlled ; but, just as sure as they give over their efforts for a single year, the insect will come to the front again, and, if two or three years were allowed to pass without treatment, a great many trees would be lost.

In one particular district in Ontario the fruit-growers protested strongly against the measures adopted by the Provincial Government to control the scale, but at the same time it was found afterwards that they had done nothing to treat their trees to prevent the scale from spreading. As a consequence, during the past season this district has become one of the very worst infested. There was at one time in the United States the same difficulty in persuading fruit-growers to treat their trees. Prof. Webster in his bulletin (No. 103, Ohio Agr. Exp. Station), 'The San José Scale Problem in Ohio, in 1898,' says: 'Heretofore it has sometimes been difficult to get the owners of some slightly infested orchards to apply whale-oil soap, but this season has taught them a lesson that they will not soon forget, for, while they stubbornly refused to treat their orchards last spring, they now have the rather humiliating spectacle of trees on their own premises almost if not quite totally devoid of fruit, while their more progressive neighbours, who invested their money in whale-oil soap and applied it faithfully, have plenty of fruit and no longer fear the San José Scale. Many orchards whose owners could hardly have been induced to treat their trees last season on suspicion of the San José Scale being present, will hereafter be treated on the slightest possible suspicion of the scale being present, and the owners will do it willingly.'

Prof. Lochhead, of Guelph, who has devoted much time and attention to the question of the San José Scale in Ontario, says, under date December 22, 1900 :

'This is the cloud which is hovering over the fruit-growers of south-western Ontario at the present moment. They recognize now that the scale has spread very widely during the past season, and has also increased in intensity. They know also now that no remedy need be applied in a slipshod fashion. To my knowledge the scale is spreading from new centres not previously known. The remedies are known, but it remains for the owners of orchards to follow the prescription closely which has been given by entomologists. The nurseries will be more closely watched than ever this coming year, so that no infested stock can possibly leave the grounds.'

It will be seen from the above precautionary measures, which are being strictly enforced by both the federal and the provincial governments, that every possible effort is being made in Canada to-day to control, if possible, this terrible pest, and to prevent by every means fresh introductions. Not only is every woody-stemmed plant imported into Canada from infested countries fumigated with hydrocyanic acid gas, but every nurseryman in Ontario is forced to submit to the same treatment every shrub and tree supplied to customers.

THE PALMER WORM
(*Ypsolophus pometellus*, Harr.).

Attack.—Slender greenish white caterpillars, reddish brown on back, with a central stripe down the middle, bordered on each side with white irregular bands ; when full-grown, a little over half an inch in length ; feeding on the leaves, and sometimes on the surface of the fruit.

Complaints of the work of this insect have been received from several localities during the past season, particularly from sections along the northern shore of Lake Ontario. It has also been found as far north as Ottawa. Judging from reports received, the Palmer Worm has confined its attacks chiefly to the apple. From a letter received from Mr. A. W. Peart, of Freeman, Ont., dated June 19, the following is extracted :—

'I enclose in small box some worms which are very plentiful here at present, working particularly on the apple. They vary in size from a ¼ of an inch to ⅝ of an inch in length. They are a light yellow with two stripes running lengthwise on either side of the back. Their most marked characteristic is their rapid motion. Take one in the palm of the hand, and touch it, it wriggles and jumps an inch or two with rapid lightning-like contortions. When you catch one, it is hard to hold. Like the cankerworm, it spins a thread when you disturb a branch, and lets itself down, and you can see it swinging ; but unlike the cankerworm, it does not loop in travelling. I find it in holes eaten in the young apples, and I think it is responsible for at least a portion of the cavity, if not all. On some trees, with their leaves badly riddled, you can find them by hundreds.'

Letters of a similar nature to the above have been received from Oakville, Adolphustown, and other points.

The life-history of the Palmer Worm is fairly well known. When the caterpillars are young they eat only the soft tissues of the leaves, but, as they mature, they devour the whole of the foliage, with the exception of the coarser veins. This is especially so when the larvæ are numerous. When the infestation is not of a serious nature, the caterpillars may be found feeding in a folded portion of a leaf. These larvæ are extremely active, and, as has been observed above, if a tree on which the caterpillars are at work is suddenly jarred, the larvæ will drop from their feeding places, and suspend themselves in the air by means of silken threads. If one is placed on any flat surface, it wriggles, and when touched moves with remarkable rapidity.

When full-grown, the caterpillar is a little over half an inch in length, and in general appearance is a greenish-white larva, with the dorsal area reddish brown, having a central dorsal stripe widely bordered on each side with white irregular bands, a little wider than the medio-dorsal stripe. The head is honey-yellow. The thoracic shield is transparent and inconspicuous, having the hind margin borderded with black for half its length, the black edge terminating with a hook forward on each side of the shield, leaving a wide central opening. The stigmatal fold is prominent. Along the dorsal area are two series of black piliferous spots, those on the anterior portion of each segment closer together than the others. Spiracles whitish, difficult to detect. The body bears a few slender bristles, one from each spot.

When mature the caterpillar changes to a chrysalis, usually in a fold of a leaf, and produces the moth in about fourteen or fifteen days. Those received on June 28 spun up on July 2, and the moths appeared on July 16 and 17. The moth is a delicate little creature of about five-eighths of an inch in expanse of wings. It is of a grayish-brown colour, with a purplish or golden reflexion ; some specimens are of a tawny yellow. The forewings are dotted with small dark chocolate-coloured spots. The margins of the dusky lower wings are deeply fringed.

Remedy.—The remedy for this insect is spraying with the arsenites. A hymenopterous parasite was bred from this species by Mr. C. H. Young, of Ottawa.

THE GREENHOUSE LEAF-TYER

(*Phlyctaenia ferrugalis*, Hbn.=*Botis harveyana*, Grt.).

Attack.—Slender semi-translucent green caterpillars, when full-grown, nearly an inch in length, with two distinct black spots (one on each side) close behind the head, the green dorsal vessel showing distinctly down the middle of the back, bordered on each side with a double white band ; feeding on the cellular tissue on the lower sides of the leaves. In many cases the leaves are drawn together by threads of fine silk.

In my last report the above insect was treated of at some length, and, as it is now still prevalent in the same locality (Toronto) and has appeared in other houses in Hamilton, I again draw special attention to it, for unless checked it is liable to spread and possibly become a serious greenhouse pest in Canada. In Toronto last year the larvæ did much harm, causing considerable loss to roses, but this year the species is also attacking violets and chrysanthemums. On November 12, Mr. Arthur Gibson, of this Division, paid a visit to the houses of Mr. J. H. Dunlop, Toronto, and specimens of the larvæ in all stages, pupæ and moths were found in some abundance. In one of the chrysanthemum houses especially, the insect was very prevalent and numbers of the moths were flying at the date mentioned. In this house some eggs were found, and these have since hatched in the office and proved to be the same species.* The eggs were laid on the under side of the leaves. They are flattened and remarkably like those of the Codling Moth, dirty-whitish, about one-half mm. in width, round, strikingly iridescent, the surface coarsely reticulated (which gives them a slightly roughened appearance), and are laid sometimes singly, in pairs, or in clusters of 3 to 7, the eggs of which overlap at the edges. The work of the caterpillars was only noticed on the underside of the leaves, and in the case of the mature larvæ large pieces of the soft tissue were eaten away. The caterpillars were generally found to be within a slight silken web, and in many cases two leaves were brought together and fastened by threads of silk, the larva feeding on the soft tissues on the underside of the upper leaf. The young caterpillar, as soon as it hatches from the egg, is about one-twelfth of an inch in length, and of a semi-translucent creamy-white colour, with a large black head. The body bears slender whitish hairs, and the skin is smooth and shining. After they have been feeding, the colour of the green food contents gives the caterpillars a slight greenish appearance. In the second larval stage, pale whitish stripes are present on the body, and these, as the larva passes through its other stages, become more distinct. When mature the caterpillars are about three-quarters of an inch in length, slender, semi-translucent, with the dark-green dorsal vessel showing distinctly through the skin, but rather faint on segments 2, 3 and 13. On each side is a double white sub-dorsal band which is also rather faint on segments 2, 3 and 13. On segment 2 are two distinct black spots, one on each side of the dorsal area. Head about one twenty-fifth of an inch in width, bilobed, smooth, shining, whitish, splashed with brownish blotches on cheeks and bearing a few pale hairs. Mouth parts brownish; ocelli black. Spiracles white and very small, joined by a faint whitish line. On segments 2, 3 and 4 this line is represented by a few faint white dots and is obsolete on segment 13. Thoracic feet and prolegs of the same colour as the body ; the thoracic feet each bear exteriorly two black dots, one above the other. The whole body is sparsely covered with slender pale hairs, the ventral surface being lighter in colour than the dorsal. When at rest these caterpillars have a habit of curling round to the side of the body their heads and the first three or four segments. The duration of the pupal stage is from seventeen to twenty days. The moth is of a rusty-brown colour, and when the wings are spread measures a little over five-eighths of an inch in width. When at rest it measures three-eighths of an inch at widest part. The wings are crossed with darker lines and also bear darker markings.

As to remedial treatment, the picking of the leaves on which the caterpillars are at work is recommended, and in the Toronto houses good work in this direction has

* Many eggs have since been secured from moths kept in confinement.

been done; large numbers of the moths have also been dislodged from their resting places and killed. The proper carrying out of such work, however, takes up too much time, especially if many large houses have to be gone over, and, as this insect is almost continuously at work when once established, no doubt fumigation with hydrocyanic acid gas is the quickest and most effective remedy.

A GREENHOUSE LEAF-ROLLER
(*Cacoecia parallela*, Rob.).

Attack.—Dull green caterpillars about an inch in length when full-grown, with yellowish-brown head and thoracic shield ; each segment but the first two bearing conspicuous white piliferous tubercles ; feeding on the foliage of rose bushes in greenhouses, drawing the leaflets together by threads of silk, or rolling a leaf up and spinning a web inside.

In my last report I recorded the occurrence of two new greenhouse pests in Canada, viz., the Greenhouse Leaf-tyer *(Phlyctaenia ferrugalis,* Hbn.), and the Black Violet Aphis *(Rhopalosiphum violae,* Perg.*)*, both of which occurred at Toronto. During the past year there was brought under my notice for the first time in Canada the work of another insect, attacking the foliage of rose bushes in greenhouses of Messrs. Webster Bros., at Hamilton, Ont. Specimens of the caterpillar were sent to the Division, and these have since been bred to maturity, and proved to be those of a small tortricid moth, *Cacoecia parallela,* Rob., somewhat resembling the Oblique-banded Leaf-roller, which has long been known to injure roses, particularly out of doors.

The caterpillars of *Cacoecia parallela,* Rob., were first noticed doing injury at Hamilton in June, 1899, and since then they have appeared in hundreds, causing great annoyance and damage. The larvæ were particularly prevalent during the present year, from the end of March until about the middle of October. The work of the caterpillar is much after the style of both the Greenhouse Leaf-tyer and the Oblique-banded Leaf-roller. It feeds on the green foliage and has the habit of drawing the leaflets together by means of threads of silk, or rolling a leaf over, spinning a web and feeding inside.

The caterpillar when full-grown is about one inch long ; it tapers slightly to each end and has the segments distinctly marked. The colour is dull green, overlaid lightly with velvety black, of a slightly darker shade on the dorsum. The piliferous tubercles are white and conspicuous, bristles long and slightly wavy. The head is round, slightly depressed in front, of a yellowish-brown colour, and bears some slender light hairs ; mouth parts and antennæ darkened; ocelli black. Behind each cheek, at the back of the head, is a black elongated blotch in line with the ocelli. Thoracic shield honey coloured, with two small back spots on the front margin, divided by the pale median line. The posterior margin of the shield is bordered heavily with black, which gradually enlarges into a wide blotch towards the apex. Like the double blotch on the front margin, these blotches are separated by the median line. Below the thoracic shield are two short tubercle-like chitinous dashes, the upper of which is immediately in front of the spiracle. Each of these dashes bears a pair of bristles. The anal shield is darkened towards the apex and bears several slender bristles. The conspicuous white piliferous tubercles are arranged as follows :—The sub-dorsal tubercles are widely separated, so as to bring them and those of the lateral series almost into line. The supra-stigmatal tubercles are immediately above and close to the small black-ringed spiracles, in some cases partially inclosing them. The infra-stigmatal tubercles are directly below the spiracles, and separated from them by twice their width. The supra-ventral tubercles lie in a line directly below those of the lateral series. There is a ventral series of large double tubercles which lie at the base of the prolegs and thoracic feet, and each of which bears two or three bristles. On segments

5, 6, 11, 12 and 13, there is beneath each segment a series of small ventral tubercles on each side of the medio-ventral line. The thoracic feet are shiny, black, white at joints, and almost ringed at the base with a narrow shiny black band, which is open on the outer side. The prolegs are concolorous with the ventral surface. All the feet bear short hairs.

When full-grown the caterpillars spin light cocoons among the leaves, two or three of which they gather together. The pupal period of specimens bred during the past season was about nine or ten days.

The moth, which, in a superficial way, closely resembles the well known Oblique-banded Leaf-roller, measures from three-quarters of an inch to very nearly an inch in expanse of wings, and in greenhouses there are several broods in the season. The colour of the upper wings is a pale brown, crossed obliquely by three bands of a much darker shade, the central one of which is clearly defined at its margins. The other two bands fill up the apical and basal areas of the wings. In many specimens the basal band is almost obliterated. The whole wing surface is loosely reticulated with indistinct basal lines. Under wings paler than the upper.

Fig. 17.—*Cacœcia parallela.* (After Prof. O. Lugger.)

Although rather smaller, this moth resembles the Oblique-banded Leaf-roller very much in general appearance, but it will be seen by the above description of the larva that these two insects are very different indeed in the caterpillar stage of their existence. The larva of the Oblique-banded Leaf-roller may in general terms be described as a green larva with a very dark brown, almost black, head, while that of the above is a blackish green caterpillar, with a yellowish head, and having the body conspicuously dotted with white tubercles.

Owing to their habits, the caterpillars are rather difficult to reach with remedies. Spraying with Paris green and water was tried to a limited extent, but it was not thought to have a sufficiently beneficial effect to continue the applications. This failure, it was claimed, was due to the way in which the caterpillars protect themselves. There is no doubt, however, that many of the larvæ were destroyed, and doubtless more would have been killed if the spraying had been continued longer at short intervals. In the above houses only two applications of Paris green were made, and as this did not appear to have good results, the caterpillars were left to themselves, and no further treatment was applied to the foliage. Late in the season (September) the moths were very numerous, and hand-picking of the larvæ was resorted to, a good sharp boy being sent through the houses early every morning to pick the caterpillars from the bushes. All the larvæ obtained in this way were burned.

Remedies.—As regards remedial treatment, of course, hand-picking of the caterpillars has certainly some beneficial result ; but, as I have pointed out in the case of the Greenhouse Leaf-tyer, the carrying out of such work carefully and properly, takes up too much time, especially if large houses have to be gone over. If the infestation is light, hand-picking will probably be all that is necessary, but when the insect is at all abundant in large houses, spraying or dusting with poisonous mixtures or fumigation with hydrocyanic acid gas are the most effective remedies. Fumigation with this gas, however, must be done carefully and strictly according to instructions, and if such treatment is adopted by any one to destroy greenhouse insects, unless they are fully posted on the matter, communication should previously be entered into with this Division, when full information will be cheerfully given. Hydrocyanic acid gas is now largely used to destroy greenhouse insect pests, but its very dangerous nature must not be overlooked.

SOME INSECTS OF SPECIAL INTEREST REPORTED TO THE DIVISION OF ENTOMOLOGY DURING 1900.

(Detailed Treatment of which in the Present Report is Precluded by Want of Space.)

FODDER CROPS.

The Clover Root-borer *(Hylastinus obscurus,* Marsh,=*Hylesinus trifolii,* Mueller).—Reported at a few places in Ontario. The worst occurrences in old clover fields at London, Picton and in a small patch at Ottawa. Remedies : A short rotation and the ploughing down of infested fields as soon as there is a pretty good growth after the hay has been cut.

The Large Clover Weevil (*Phytonomus punctatus,* Fab.).—Larvæ found at Picton, Ont., on May 24, in large numbers, but so severely attacked by the parasitic fungus *Entomophthora phytonomi,* Arthur, that little injury was done.

The Green Clover Weevil (*Phytonomus nigrirostris,* Fab.).—Occurring with the last named at Picton and also abundant in clover fields at Ottawa. Remedy : Early cutting. The larvæ feed chiefly in the sheathing bases of the leaves and in the flower heads.

ROOTS AND VEGETABLES.

Cabbage Worms (*Pieris rapae,* L.).—This common enemy of the market gardener was particularly abundant in all parts of Canada this year. Reported as abundant and destructive at Kaslo, B.C., by Mr. J. W. Cockle, who observed it first in British Columbia last year. For the first time this year it appeared on Vancouver Island, and did much harm to cabbages and mignonette in gardens (J. R. Anderson, R. M. Palmer and G. A. Knight). In Ontario it was destructively numerous in the counties north of Lake Ontario, injuring the turnip crop seriously ; also reported as one of the worst pests in Nova Scotia (Harvie Gray) and parts of Quebec.

Remedy : Dusting with Pyrethrum and lime (or some other dry diluent), and spraying with arsenical poisons in turnip fields.

Root Maggots (*Anthomyia*) of Cabbages, Cauliflowers, Radishes and Onions.—Many experiments were tried with more or less success. On cauliflowers and cabbages the best results were secured by using the Gough tar-paper discs which have been reported upon previously. For the other crops, carbolized mixtures seem to be of greatest promise.

These insects are reported to have been unusually scarce at Nappan, in Nova Scotia, this season, and as a consequence good cabbages and cauliflowers were grown (W. S. Blair). At other points in Nova Scotia (K. McIntosh), New Brunswick and Prince Edward Island (Father Burke), they were as destructive as usual.

Cabbage Pionea (*Pionea rimosalis,* Gn.).—Destructive in turnip fields in Prince Edward Island (S. A. Stewart and G. F. McKinnon).

Turnip Aphis (*Aphis brassicae,* L.).—A considerable amount of harm has been done by the Turnip Aphis in a few localities, but the complaints this season have been far less numerous than has usually been the case. The worst attacks have been in the counties of Huron and Bruce, where in some sections as much as half the crop of turnips was destroyed (H. Deacon).

Remedies : Spraying with kerosene emulsion or whale-oil soap solution, 1 pound in 6 gallons of water, at the time colonies first appear in August ; also ploughing down deeply the tops as soon as cut from the roots, as the eggs were found to be laid upon these in large quantities at Belgrave, Ont.

Diamond-back Moth (*Plutella cruciferarum,* Zell.)—Very destructive in parts of Vancouver Island (G. A. Knight) and Saskatchewan (Percy B. Gregson).

FRUITS.

Codling Moth (*Carpocapsa pomonella*, L.).—This is still a cause of enormous loss to fruit-growers. Where systematic spraying is practised, supplemented by the banding of trees with strips of burlap or whisps of straw, the numbers have been reduced to a marked degree. Many practical fruit-growers might be cited from every province of the Dominion to prove this.

Plum Curculio in Apples (*Conotrachelus nenuphar*, Herbst).—For several years this insect has been a troublesome pest in the orchard of Mr. Jack, at Chateauguay Basin, Que. In the fall of 1899 the orchard was ploughed and the land has been cultivated most of the past summer, and, as a result, no injury has been done by the curculio, except where some raspberries were left growing among the trees.

Oyster-shell Bark-louse (*Mytilaspis pomorum*, Bouché).—There is probably no orchard pest in Canada which is wider spread than this and which has destroyed more trees. A practical remedy has long been a desideratum. The standard remedy, up to the present time, has been the kerosene emulsion ; but this has never been popular, owing chiefly, I think, to the trouble of making it and its destructive effects on rubber hoses. About five years ago it was noticed that trees sprayed with Bordeaux mixture were freer from this insect than those which had not been sprayed. This was due, it was thought, to the deposit of lime from that mixture which was left on the trees.

In the course of some experiments made on apple trees which happened to be badly infested with Oyster-shell Bark-louse on the Experimental Farm by Mr. W. T. Macoun, by spraying with a lime whitewash to retard the opening of flower-buds as a protection against late frosts, it was discovered that these whitewashed trees were very much cleared of the Oyster-shell Bark-louse, and subsequent experiment shows that this is probably an easy, cheap and effective remedy against this pernicious insect. The best time to apply the whitewash is late in the autumn, so that the scales loosened by the wash may be scaled off with the lime during the winter. Spraying trees during the winter is a very unpleasant operation, so this work should be done during the warm days of November, and the strength of the whitewash which has been found effective is from one to two pounds of lime in each gallon of water. A better coating of lime is deposited on the trees if two applications are made, the second being applied as soon as the first one is thoroughly dry.

Applications of concentrated lye, as supplied in tins for household uses, were also experimented with in varying strengths from 1 pound in 3 gallons of water, up to 1 pound in 6 gallons ; but they were not sufficiently fatal to the scale insects to justify their recommendation. Even at the strength of 1 pound in 3 gallons, although the leaves of some plants were spotted, no permanent injury was done. All the samples of concentrated lye which were obtainable were found to be caustic soda.

The Pear-tree Flea-louse (*Psylla piricola*, Foerster).—This insect is widely spread through the pear orchards of western Ontario, but seldom occurs in large enough numbers to attract attention. It is, however, a pest which pear-growers should watch carefully, and treat promptly if the numbers increase. Mr. George E. Fisher, a most accurate observer, with exceptional opportunities of examining orchards, writes : 'On several occasions I have noticed Pear Psylla doing very serious damage to pear orchards. When once established it multiplies very rapidly. Here at home a number of years ago I had 300 Dwarf Duchess trees badly infested, and even now, after spraying regularly, they do not seem to have fully recovered. My neighbour, Mr. J. S. Freeman, had a block of 400 Dwarf Duchesses so badly attacked that nearly all died. In 1899, Mr. E. J. Henry, of Winona, had an orchard badly affected. I am fully persuaded that this is not an insect to trifle with, but I do not dread it as much as I did, for I now know that by the use of an emulsion of crude petroleum and whale-oil soap I can destroy such insects as winter exposed on the trees. For Psylla one must

operate early, because the eggs are laid early. In May, 1899, I visited a large Dwarf Duchess orchard belonging to Mr. Henry Lutz, of Youngstown, New York State. In 1896 this block of trees had been almost ruined by Psylla. In February, 1897, the whole block was sprayed heavily with lime, which destroyed the insect so completely that when I saw the trees two years after they appeared very healthy indeed.'

THE RED-HUMPED APPLE-TREE CATERPILLAR (*Oedemasia coneinna*, S. & A.).—Specimens of these caterpillars were sent from Kaslo, B.C., by Mr. J. W. Cockle. They were very prevalent at the time in apple orchards.

THE PEAR-LEAF BLISTER MITE (*Phytoptus pyri*, Sheuten).—Several inquiries about this have been received from British Columbia. Mr. Palmer reports : 'This insect continues to be a very persistent pest, and is quite generally distributed through the province. It is easily kept down by the use of the lime, salt and sulphur spray used in winter, but is difficult to exterminate and will reappear if spraying is neglected.'

THE BLACK VINE WEEVIL (*Otiorhynchus sulcatus*, Fab.).—Occasional references to injuries by this beetle have been made, chiefly to garden plants and in greenhouses in British Columbia. The beetle is not uncommon on the sea shore in Nova Scotia, but no injury to crops of any kind has ever been reported from that province until the past season, when specimens and an account of serious injury were received from Mr. J. H. Churchill, of Westport, N.S. Strawberry beds have been injured for many years, and among the samples received were several plants which were attacked, not only by the Black Vine Weevil, but also badly by the Strawberry Root-borer (*Anarsia lineatella*, Zeller), fortunately an uncommon enemy in Canada. This injury has been going on for about six years, during which time Mr. Churchill estimates his loss in strawberries at $1,500. In British Columbia, Mr. Tom Wilson, of Vancouver, observed another occurrence of the Black Vine Weevil, where considerable injury was done to strawberry plants and primroses. In Europe this beetle is known to be a troublesome pest of grapes, strawberries, raspberries, mangels and primroses, but up to the present time nothing of importance has been recorded against it on this continent. The strawberry plants sent by Mr. Churchill from Nova Scotia on July 8, contained grubs and pupæ of the beetles, and in another parcel received on September 19, there were grubs, pupæ, and beetles, some of the latter being immature, but a few perfectly coloured. The only remedy which can be suggested for this beetle as yet is the planting of strawberries in new ground, and frequent renewal of the beds, the worst injuries being done to old plants.

In this connection I may add that Mr. W. T. Macoun, the Horticulturist of the Central Experimental Farm, tells me that he considers the single crop method of growing strawberries the one which pays best, the fruit being finer and the land being kept clean much more easily. Some varieties which do not make runners freely should be left for two years.

Nepticula (*Micropteryx*) *pomivorella*, Pack.—This interesting little insect has been more than usually abundant in western Ontario during the last two years, and a large series of specimens have been reared. The larva is a leaf miner, but when full grown, leaves the mines and spins small cocoons on the twigs of apple trees, in which it passes the winter. It has been lately discovered by Mr. A. Busck, of Washington, that this insect, which was described as a *Micropteryx*, is a true *Nepticula*.

The LESSER APPLE WORM (*Semasia prunivora*, Walsh).—Mr. R. M. Palmer reports that this insect occurred in nearly all the fruit-growing districts of British Columbia excepting the Okanagan valley, but in smaller numbers than in 1898-9. He draws attention to the fact that this pest is still often mistaken for the true Codling Moth, by fruit-growers, but he is pleased to report that the latter has not occurred in any part of the province, although watched for carefully. A most rigorous inspec-

tion is maintained of all fruit coming into the province, so as to prevent its introduction by that means.

The Apple Fruit Miner (*Argyresthia conjugella*, Zell.) appeared in small numbers on Vancouver Island during July, but no instance of its presence in large numbers was reported.

The Mealy Plum Aphis (*Hyalopterus pruni*, Fab.) was very prevalent in many parts of British Columbia. Spraying with whale-oil soap and quassia proved an efficient remedy.

The Mediterranean Flour Moth (*Ephestia kuehniella*, Zell.).—A mill badly infested with this insect, near Ottawa, was fumigated with sulphur with satisfactory results. An interesting observation was that the larvæ were largely parasitized by a small hymenopterous insect, which has been found by Mr. W. H. Ashmead to be a new species, and has been named by him *Idechthis ephestiae.*

The Red Turnip Beetle (*Entomoscelis adonidis*, Fab.).—This native beetle, which is bright red with three black stripes down its back and a spot on the collar, and is ⅜-inch long by ¼-inch wide, was very abundant in the North-west Territories and parts of Manitoba last year. Several inquiries were received concerning its habits, and it was observed almost everywhere during July, chiefly upon cruciferous weeds, but also on turnips, radishes, &c. Upon a piece of neglected summer-fallow at Kinistino, Sask., it was seen in thousands upon the steeple-like plants of the Gray Tansy Mustard (*Sisymbrium incisum*, Engl., var. *Hartwegianum*, Watson) and upon *Erysimum parviflorum*, Nutt., and *Erysimum asperum*, DC., a near relative of the garden wallflower. This insect has been treated of at length in my report for 1892.

'Strathcona, Alta., June 1.—I send you some beetles which are abundant, climbing up the stems of some weeds on about half an acre of timothy ; they come out of the ground, which I dug up and found the holes about ½ to ¾-inch deep. Are they likely to hurt the timothy ? I have seen them before, but not so plentiful as now.'—Thomas Daly.

'Strathcona, June 12.—I send a sample of a beetle which has been doing great damage in my garden, attacking wallflowers and stocks, all young plants ; they are now on my turnips, radishes and cabbage. I have killed probably 1,000. What are they called, and what is the best remedy ?'—John H. Wilson.

'Souris, Man., September 13.—I am sending an insect which is doing much damage in gardens in the Souris district, especially at this time.'—Robt. I. Crisp.

This beetle, both as a grub and in the perfect state, attacks all cruciferous plants. The best remedy is to spray or dust the plants attacked with arsenical poisons in the same way as for the Colorado Potato Beetle. The grubs are nocturnal in their habits, and are seldom seen.

This is also a European insect, but there is hardly a doubt that it is a native species in the North-west. In certain seasons it is very abundant, and may at any time develop into a serious enemy of the agriculturist. It belongs to the Chrysomelidæ, the family to which also the Colorado Potato Beetle belongs.

The Asparagus Beetle (*Crioceris asparagi*, L.).—The Asparagus Beetles, treated at some length in my last report, have occurred again in the Niagara district during the past season, but do not seem to have been the cause of much injury. However, their attacks have been supplemented by another enemy, the Asparagus Rust (*Puccinia asparagi*, DC.), and one of the Hemiptera (*Cosmopepla carnifex*, Fab.) was found upon asparagus by Mr. Frank Arnold, at Queenston, Ont. These clustered on the plants in very large numbers during the last week of July. No special injury was noticed at that late date, and it was not thought worth while to advise any remedial treatment. Spraying with either kerosene emulsion or whale-oil soap would doubtless destroy them, should they at any time prove troublesome.

The SQUASH BUG *(Anasa tristis,* DeG.).—This troublesome enemy of the gourd family is a regular pest in western Ontario, but is seldom heard of in the eastern counties. In the last week of June specimens were sent from Inverary (Frontenac Co.), Ont., by Mr. Alex. Ritchie, with the complaint that they were destroying his squash, pumpkin and cucumber vines. The remedies recommended for this insect are :—

Fig. 18. —Squash Bug.

1. Hand-picking, which is claimed to be the most practical remedy. This is done early in the morning, during the cooler hours of the day, while the bugs are sluggish.

2. Traps. If shingles or short pieces of board are placed among the plants, the bugs will hide beneath them at night, and can be destroyed before they become active and leave these retreats the next morning.

3. The young bugs can be destroyed by spraying with kerosene emulsion or whale-oil soap.

ARMY WORMS IN WINTER.—A rather curious occurrence of the Army Worm in winter took place at Alberton, in Prince Edward Island, last February. This was reported to me by my esteemed correspondent, the Rev. Father Burke, of Alberton, who also sent specimens for identification from the farm of Mr. John T. Weeks, of the same place. The occurrence is described by Mr. Weeks, as follows :—

'Alberton, P.E.I., February 17.—I am in receipt of your letter of 8th instant, and am surprised to know that we have such a pest in our midst. The specimens I sent were supplied by my brother. He is going to try and get you some more specimens, and if he is successful he will forward them in the way you suggest. He says he saw them as he drove across several farms, and they were quite a long distance from bare ground.'—J. T. W.

'February 19.—This morning my brother came in with some more of the army worms. I am sending them in a tin box with some moist earth and some grass. These are much larger than the first I sent, but among the lot are several very small ones, which are apparently dead ; but I send them so that you may see the different stages of development. My brother tells me he saw them on at least half a dozen farms, and would have had no difficulty in picking up a hundred. We had an easterly snow-storm all day yesterday, which will probably cover them up again. I fear they seem to be pretty well distributed. To what extent are they known in Canada ? What is the remedy ?'—JOHN T. WEEKS.

In reply to these letters it was explained that the Army Worm passed the winter partially grown, in a torpid condition, near the surface of the ground, and that there were previous instances where they had appeared suddenly on the surface of snow during winter. It was suggested that this appearance in winter might prove beneficial, because many thus disturbed in winter perished. The distribution of the species in Canada was given and reports of this Division were sent, in which the usual remedies are stated.

In a report on the insect injuries of the year, Father Burke informs me that no injury whatever by the Army Worm was noticed during the past season.

THE BLACK BLISTER BEETLE (*Epicauta Pennsylvanica,* DeG.).—Injuries to potatoes by the Black Blister Beetle are reported from Dugald, Man., by Mr. Kenneth McLeod, from different parts of Ontario by Mr. C. W. Nash, of Toronto, and from Inverary, Ont., by Mr. W. T. McClement, who had also found them on the farm of Mr. John Guthrie, of Perth Road (Frontenac Co.) Ont., where, he says, they ate the tops of potatoes very cleanly, and were very active. If plentiful in a district, they would be worse than the Colorado beetle, for they are much more active. They flew ahead of the poison-can and ate the tops which were not poisoned, avoiding those dusted or sprinkled, and clustered thickly on the clean tops. They were plentiful about July 25. They were not widespread, but troubled only a few fields, and these near together.

The habits of Blister Beetles were explained to these correspondents, and also the connection of these insects with various species of locusts, upon the eggs of which the larvæ are predaceous parasites.

Specimens of an allied western species, *Cantharis cyanipennis*, Say, were also sent from Ducks, B.C., by Mr. Hewitt Bostock, who had found them injuring pea-vines in his orchard.

THE APIARY.

As in previous years, the sole management of the Apiary has been in the hands of Mr. John Fixter, the Farm Foreman. The season of 1900 has been a particularly poor one in the greater part of Ontario, but by the exercise of care and attention the colonies were housed in good condition, and as far as can be judged at this date are wintering well. Several meetings of bee-keepers were attended by Mr. Fixter, and addresses were delivered by him on practical apiculture, which were highly appreciated by his hearers. I myself had the pleasure of attending the annual meeting of the Ontario Bee-keepers' Association, at Niagara Falls, Ont., on December 5 and 6, and by request gave an address upon the Fertilization of Flowers by Bees. There was an interesting discussion upon the question whether bees could injure ripe fruit before the skin was broken ; careful experiments were cited showing that this was not the case, though bees will sometimes take advantage of a crack in the fruit or of an opening made by wasps or other insects, and will suck the juice.

REPORT OF MR. JOHN FIXTER.

Experiment in Feeding Sugar Syrup for Winter Stores.

During the winter of 1899, and the spring of 1900, great trouble was experienced with dysentery among bees in many parts of the country. The disease was thought to be due to food or honeydew gathered in the autumn. An experiment was started last autumn with four colonies. All the natural stores were extracted on September 17. A Miller feeder was placed in an empty section super, close to the top of the brood frames, any part of the brood frames not covered by the feeder being covered with a propolis quilt cut so as to allow the bees a passage through it or on its side. By keeping the feeder well packed, except where the bees enter, the heat is kept in and at the same time the bees cannot daub themselves with the liquid. In this experiment the bees had a constant supply of syrup. This syrup was made of the best granulated sugar, two parts to one part of water by weight. The water was first brought to a boil, then the boiler was set back on the stove and, the sugar having been poured in, the mixture was stirred until the sugar was all dissolved. This syrup was supplied to the bees at about blood heat.

At the beginning of the feeding the average weight of the hives and colonies was 33½ pounds, and at the close 52½ pounds. It required 80 pounds of sugar to make up the weight of the four colonies to carry them through the winter and spring successfully. The weight of water used to make the syrup should not be taken into account, as it is afterwards all evaporated during the winter.

Experiments in Wintering, 1899-1900.

Experiments in wintering bees were continued in the cellar, in a root-house, in the house apiary and in a pit dug in a hill side. The results were very much the same as those described in the report for 1898 (at page 213).

The Season of 1900.

March 10.—The temperature being 41° Fahr., and the day bright and calm, eighteen colonies were removed from their winter quarters ; of these six were again placed in the exposed apiary, when there was about 18 inches of snow on the ground; six were placed in the sheltered apiary, where there was also considerable snow; and six were placed in the house apiary. As soon as they were settled on their stands, the bees all began to fly at once, the weather being fair and calm. They were thus enabled to cleanse themselves and return ; the snow was discoloured for a considerable distance around the hives. Very few bees were noticed which were unable to return.

March 31 and April 1 being fine and warm, the colonies of all three apiaries had good cleansing flights. From April 2 to 6 there was very little flying, the weather being cool and windy. On April 7 the bees in the house apiary and in the sheltered apiary were flying well, while those in the exposed apiary could scarcely be seen to move out.

The balance of the colonies were taken from their winter quarters on April 8, the temperature being 44°. The weather was too cold for the bees to come out to have a cleansing flight until April 11, when the temperature rose to 54°, and all began to fly. The colonies first set out were flying as well as is usual in the month of May.

From April 11 to 18, there was very little flying, on account of cool winds and wet weather.

On April 18 an examination was made of the colonies set out early in the different apiaries, and of those set out later, that is, at the usual time; the purpose being to find out whether any difference could be seen as to the strength of the colonies. In every instance, we found that those set out first, more especially those in the house and sheltered apiaries, had more brood and eggs, and appeared to be very much more active than those set out later. When once they get a good cleansing flight, whether through activity or from getting water, whatever may be the cause, more brood and eggs are found in the hives. I would advise setting the bees out just as soon as they can fly out safely. The colonies which are set out a few days earlier will be by so many days further advanced at the beginning of the honey flow, that is, those set out later will require so many more days to become as strong after the beginning of the honey flow.

On April 18 the temperature went up to 69°. The snowdrops and squills blossomed, and the bees were seen to work on them at once. On April 20 and 21, the swamp willow, soft maple and Manitoba maple, came into bloom. This time would have been too late for the removal of the bees from their winter quarters, for they would before this have become restless ; many would have left their hives and been lost on the cellar floor.

From April 19 to 25 the bees were seen gathering pollen or sap running from the trunks of hard maple trees that had been injured.

April 26.—Very high wind, increasing to a hurricane in the afternoon—the day of the big Hull and Ottawa fire.

April 27 to May 7.—Weather very fine ; all colonies working well, gathering pollen and honey. Every colony was building up rapidly.

At this time, and also from the blossoming of fruit trees to that of clover, the greatest care is necessary, so that there may be no check in brood rearing. When the queen stops laying, or when starved brood or dead larvæ are observed in the hives, many beginners, and even many experienced men, imagine that the cause is some disease, and at once send for the Inspector of Foul Brood. An instance of this is given on a later page (Appendix A), with the answer of the Inspector of Foul Brood (*see* page 247).

May 8-10.—Very cold winds; scarcely any flying.

May 11-16.—Very fine weather; bees working well.

May 17 and 18.—Very dull and cold ; scarcely any flying.

May 19 to June 7.—The bees gathered a great amount of pollen, but very little new honey ; nearly every hive was full of brood and young bees.

The first drones were noticed on May 28. A considerable amount of honey and syrup was fed from May 1 to June 8 in order to keep up brood-rearing and to prevent starving.

On June 7 and 8, White Dutch Clover and Alsike came into bloom, and there were many flowering trees and shrubs in bloom, but there was very little increase in honey.

June 8 to July 15, the bees gathered a small amount of honey from clovers and basswood.

On July 15 the first honey was taken off ; bees were very thick on flowers ; but there was very slight increase in weight of hives during the latter half of July.

After August 3, the bees gathered very little honey, and there was no increase in weight of the hives. The autumn flowers gave no surplus, and, there being no buckwheat sown in this district in 1900, no honey was gathered from that source.

September 1 to 10.—All colonies and hives were weighed in order to ascertain how much they had lost or gained. They were weighed again on October 1 and on November 12, just before they were put into their winter quarters. Any colony and hive found to weigh less than 50 pounds on September 1 was either given full frames of sealed honey or fed syrup to make up the difference in weight. While our experiments show that each colony consumes only from 9 to 14 pounds during the winter, it is a very wise policy to have 10 or 15 pounds extra in each hive to be used in spring before the honey flow.

Average weight of forty colonies and hives :

On October 1, 51¾ pounds.
On November 12, 49 pounds.

The forty colonies had therefore lost altogether 110 pounds. The greatest loss of any colony was 4½ pounds, the smallest ½ pound.

All were put into winter quarters on November 12.

LIST of Plants, Trees and Shrubs on which the bees were seen working well during the summer, and dates at which the visits were first noticed.

April 18—Snowdrops and squills.
" 20—Manitoba maple and soft maple.
" 21—Willows in swamps and on lawns.
May 10—Tulips.
" 11—Plum and apple trees.
" 12—Dandelions.
" 19—Wild black cherry tree.
" 22—Grape hyacinth.
" 22—Garland Flower *(Daphne Cneorum)*.
" 23—Vinca, several varieties.
" 23—Anemones and alpine poppies.
" 23—*Adonis vernalis*.
" 23—*Doronicum Caucasicum*.
" 24—Sand cherry.
" 24—Currant bushes.
" 24—Siberian Pea-tree *(Caragana)*.
" 25—Pear and cherry trees.
" 25—Lilacs, several sorts.
" 25—June berry.
" 25—Polemoniums.
" 27—Pæonies and Irises.
" 29—Honeysuckles and barberries.
" 31—*Pyrus baccata*.
" 31—Mountain Ash.
June 1—Strawberries.
" 2—Buckthorn bushes and hedges.
" 4—Forget-me-not.
" 4—Ginnalian maple.
June 4—Rhubarb.
" 4—Mountain Centaury.
" 4—*Ajuga Genevensis*.
" 4—*Anemone narcissiflora*.
" 7—White Dutch clover.
" 8—Alsike and sainfoin.
" 8—Raspberries and blackberries.
" 8—Sharp-leaved common Cotoneaster.
" 8—Alliums.
" 8—*Rosa rugosa*.
" 8—*Spiræa VanHouttei*.
" 12—Golden-leaved Spiræa.
" 12—Highbush Cranberry *(Viburnum Opulus)*.
" 14—Geraniums.
" 14—Wild vetch.
" 19—Large red poppy.
" 19—Strawberry-flowered Cinquefoil.
" 10—*Lupinus*.
" 21—Golden Groundsel.
" 21—Wild Mustard.
" 21—*Dictamnus*.
" 23—Locust.
" 23—*Rosa multiflora Japonica*.
" 24—English horse beans.
" 28—Broad-leaved Bellflower.
" 28—*Anchusa altissima*.

July 1—Sweet clover *(Melilotus albus)*.
" 8—Asparagus.
" 8—Grass Peas.
" 8—*Lathyrus sylvestris Wagneri.*
" 8—*Eremurus altaicus.*
" 8—*Sedum Kamtschaticum.*
" 8—*Thalictrum aquilegifolium.*
" 11—Basswood.
" 14—Lilies, different varieties.
" 14—*Veronica*, different varieties.
" 14—Mulleins.
" 15—Double Queen of the Meadow.
" 15—*Linaria.*
" 15—*Asclepias tuberosa.*
" 15—*Agrimonia.*
July 18—Mignonette.
" 23—*Hypericum Kalmianum.*
" 27—*Echinops Ruthenica.*
" 28—*Lychnis.*
" 30—*Solidago.*
Aug. 9—Button Bush *(Cephalanthus occidentalis).*
" 9—Pumpkin.
" 9—Late-sown English horse beans.
" 11—Campanulas and Rudbeckias.
" 21—Sunflowers.
Sept. 1—Wild Asters.
Oct. 4—African Marigold.
" 4—Gaillardias.

Experiments with Comb Foundations in Sections.

As there has been in connection with the production of comb-honey a difference of opinion as to the proper size of foundation to use, a thorough test was made with comb foundation of different sizes in the sections.

The results show that it is of great importance that the sections should be filled up to the sides and bottom with comb foundation. On examining the different sections in this experiment, it was found that the smaller the piece of foundation was, the more holes or gaps there were around the comb in the sections, and the comb was thus less firmly fastened around the sides and bottom to the wood.

The following sizes of comb foundations were tested :—

1. Full sheets fastened at the top and fitting closely to the sides and down close to the bottom.

4. Two inches square in centre of top section.

3. Quarter sheets across upper end.

4. Two inches square in centre of top of section.

5. One inch square in centre of top of section, besides a narrow strip of about half an inch across top and bottom.

6. No foundation at all.

From past experience, I would recommend that full sheets be always used. The bees worked on the full sheets first, and these were filled more evenly and very much better.

Many inquiries are made why bees will not work in supers, when the other colonies in the same apiary are working on drawn combs in extracting frames. The explanation is that the pieces of foundation in the sections were too small. Many bee-keepers, even experienced bee-keepers, do not put much foundation in the brood chamber when hiving new swarms, though they put full sheets in the supers ; consequently, the bees fill the sections in the supers first.

The experiment with different makes and sizes of hives was not completed owing to the very poor season.

House Apiary.

The House Apiary has again been tested and has worked very satisfactorily, as far as summer management is concerned ; but, for wintering, every one of the past six winters it has proved to be a failure.

Returns.

The experience of the past season has been a repetition of that of 1899. Reports from most parts of Ontario and Quebec show that there has been a very poor honey

flow, poorer even than 1899. In many places no surplus was secured, and bees have had to be fed more or less during the autumn.

Swarming was also poor on account of the shortage of honey. All the swarms that came out at the Experimental Farm Apiary were made to go back to the mother hives or were put with weak colonies ; 18 of the old colonies were doubled up, leaving now on hand 42 colonies.

The returns from the experimental apiary show an average of only 13 sections per colony. The colonies which were run for extracted honey gave 19 pounds per colony.

John Fixter.

Appendix A.

An Ontario bee-keeper wrote as follows to Mr. Wm. McEvoy, Inspector of Foul Brood for Ontario :—

'Dead brood appeared in half of my colonies. There would be from one to five or ten dead larvæ in a colony, and some of these I often found in capped cells, when I opened them with a penknife.

'I tried the starvation plan. Several of the colonies I starved twice, as the larvæ continued dying. I even destroyed two sets of foundation. Just think of the time and patience required to look into every cell in 80 colonies ; this I did several times. I had made up my mind to clean them up. I have melted many a score of white combs and super combs. I wish to be first on your list for inspection next summer. I may buy a lot of colonies which will be subject to your inspection.'

Mr. McEvoy's answer is full of valuable information :—

'Your colonies ran out of unsealed honey while they had a large quantity of brood on hand to feed, and then your bees did not uncap the sealed stores fast enough to keep pace with the amount of brood that required feeding, and the result was that considerable brood died of starvation. And some time after that the brood would suffer in proportion to the length of time that the brood nest was short of unsealed stores, and it would end in an increase of starved brood, which the bees would allow to remain in the combs for some time after the honey flow commenced. You never would have found one cell of dead brood in any of your colonies if you had kept them well supplied with unsealed stores. You may say that I am very much mistaken as to the cause in your case, but I am not ; I have travelled over every inch of this line for fully twenty years and from close observing, feeding and watching results, I have found that such is the cause why the bees fail to feed all the brood at certain times.

'On the night of May 28, 1889, we had a killing frost all over the province of Ontario, which was followed by several days of wet weather. That frost coming at the end of one of the warmest and most favourable springs ever known for bees, was a serious thing, because it caught all hives full of brood and suddenly stopped all the honey flow at the time when every colony had an immense quantity of larvæ to feed. I warned every bee-keeper at that time that he could look out for a wholesale starvation of brood and a very small crop of honey if he did not go to work and feed his bees so as to give them a chance to feed the larvæ. I kept my brood chambers well supplied with unsealed stores (through uncapping and feeding) until the honey flow began again. By thus doing, I secured one of the largest yields of honey I ever took, and I did not see one cell of dead brood. Late in the summer of 1889, many a bee-keeper became very much alarmed when he found his brood chamber in a rotten state with dead brood. Spraying of combs, starving the bees, and other methods were resorted to, to stamp out the dead brood. If these men had gone to work right after that great frost of May 28, and kept the brood chambers well supplied with unsealed honey through uncapping a part of the old sealed stores at one time, then another afterwards, and so on until the honey flow began again, they would have had

the most of the old honey used up and more space filled with brood ; at the same time they would have had an increase in the number of the bees and would have secured a much larger yield of honey ; there would have been also no dead brood. The very wet weather that set in all over the province in the last half of May and first week in June, was very hard on the constitution of thousands of colonies, because it prevented any honey gathering during that long rainy time, and after the bees used up the unsealed honey (a thing they always use first) they did not uncap the old sealed stores fast enough to keep pace with the large quantity of larvæ that required feeding ; the result was a lot of starved brood, weak colonies and a small honey crop in many places. During the three weeks of wet weather I kept my colonies well supplied with unsealed honey by uncapping the sealed stores from time to time until all was used up, and after that I fed the bees until they commenced to gather honey. When the honey season opened, the combs in every brood-chamber were full of brood, and a large number of bees were hanging out on the front of every hive. I then put supers on, and from ninety colonies in that off season I took over 10,000 pounds of clover honey and left abundance for the bees to winter on. Last season I kept my colonies supplied with unsealed honey between fruit bloom and clover bloom, and when I finished extracting the balance of my crop in the fall I found I had taken over 11,000 pounds of clover honey from 100 colonies, and left plenty to winter the bees. You say that you tried the starvation plan and the dead brood showed up again ; also that you starved several of them twice. I am certain that dead brood (starved brood) would not have shown up again after you put the bees on foundation, if you had fed the bees freely until they began to gather honey. You also say that many a score of white comb you melted. What a loss ! These beautiful combs should not have been melted. With different management you could have made $250 or more, and saved all the combs and yourself from a world of worry.'
—J. McEvoy.

WEEDS.

SPRAYING FOR DESTRUCTION OF MUSTARD.

In my last report an account was given by Mr. Frank T. Shutt, M.A., F.R.S.C., Chemist to the Dominion Experimental Farms, of some experiments carried out by him, with the assistance of the Horticulturist of the Central Experimental Farm, to test the efficacy of the French method of eradicating Wild Mustard by spraying infested growing crops with solutions of copper sulphate. The conclusion arrived at from these experiments was, that a 2 per cent solution of copper sulphate, applied at the rate of 50 gallons to the acre, when the mustard plants were young, was the most effective, safest (as regards the grain crops) and most economical to use. The average cost of this application would be $1 per acre.

During the past summer, the Horticulturist, having men and horse-power at his disposal, again tested this remedy, and the results were again successful, although the experiment was carried out rather late in the season, and under certain other disadvantages as to the nature of the crop infested and the weather which prevailed at the time.

Mr. Shutt has drawn my attention to an important article on the subject, entitled 'The destruction of Charlock,' by Dr. J. Augustus Voelcker, in the Journal of the Royal Agricultural Society of England, vol. X, pt. 4, pp. 767-775, which, on the whole, confirms Mr. Shutt's conclusions and gives much valuable information on the subject. One quotation from a report made by Mr. Wm. Carruthers, the Consulting Botanist of

the Royal Agricultural Society, on some of the experiments referred to, is of particular interest to Canadian experimenters, who have been disappointed at the results sometimes obtained when spraying has been tried for the destruction of mustard in districts where the Bird Rape (also called Kale, or Smooth-leaved Charlock) is abundant. This is particularly the case in Manitoba, where by far the greater proportion of the plants called Wild Mustard are really Bird Rape *(Brassica campestris,* L.) 'I have not been able to detect anything in the structure of the Charlock that should make it so readily a prey to the copper sulphate. This is still more remarkable when we find that it does not in the least injure another species in the same genus, which in Cumberland is known as the "Smooth-leaved Charlock." This plant, the *Brassica campestris* of Linnæus, is very common in some districts. A correspondent in Cornwall writes that it is very common in his county. He has observed that while the common Charlock is easily destroyed by copper sulphate, the smooth-leaved plant is quite uninjured by it. This is probably the explanation of the difference in the testimonies as to the influence of copper sulphate on Charlock. The two plants so closely resemble each other that only a careful observer can distinguish that they differ. The true Charlock *(Brassica Sinapistrum,* Boiss.) is destroyed by treatment, while the smooth-leaved Charlock (*Brassica campestris,* L.) is not affected.

'As the general outcome of Mr. Hornsby's experiments, it would seem that for Charlock when still young, 40 gallons per acre of 2 per cent solution of sulphate of copper would be found effectual, but that, if the Charlock were already in flower, as much as 60 gallons of a 4 per cent solution would be required.'

REPORT OF THE POULTRY MANAGER.

(A. G. Gilbert.)

To Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I beg to inclose herewith the thirteenth annual report of the Poultry Department.

Some space has been devoted to the results of observations made during the past three spring seasons in connection with the hatching of early eggs from hens which laid all winter and were gently stimulated to do so. The conclusions arrived at will doubtless be useful to the many persons interested.

The matter is an important one, as it has direct bearing on the profitable results, or otherwise, attached to the hatching and rearing of early chickens by artificial or natural means. It is well worthy of further careful scientific investigation.

Information is also given, in detail, on the several points of poultry raising and best methods of fattening, killing, dressing and packing of the birds for shipment to British markets, or for home consumption.

The characteristics of the leading Standard breeds are described and the weights of the fowls given. Cuts of the leading breeds are also given.

During the year addresses on subjects akin to my department were delivered at the following places, viz. :—

Ontario.—Peterborough, Lansdowne, Gananoque, Toronto, Guelph, Renfrew.

Quebec.—Brigham, Mansonville.

Prince Edward Island.—Marshfield (2), Alberton, Centreville (2), New Glasgow, Montague Bridge, Murray Harbour South, Eldon, Kensington, Tyne Valley, St. Peters.

British Columbia.—Lulu Island, Central Park, Port Hammond, Abbotsford, Mission City, Chilliwack, Metchosin, Royal Oak, Ganges Harbour, Duncan's, Ladner's, Surrey Centre, Agassiz, Langley.

Manitoba.—Neepawa, Portage la Prairie, Carberry, Brandon, Winnipeg, Emerson, Morris, Morden, Manitou, Pilot Mound.

A feature of the Renfrew meeting was a large display of dressed poultry, consisting of turkeys, geese, ducks and chickens. The birds were divided into numerous classes, for which prizes ranging from $7 to $1 were given. This brought out a large number of competitors. Several chickens dressed in most approved methods were taken from our poultry department. At the meeting held in the afternoon, after the fair, the manner of plucking, dressing and drawing the chickens was explained. The object lesson was much appreciated.

I have again the pleasure of testifying to the faithful services of Mr. George Deavey.

The marked increase in correspondence and requests for information in regard to all phases of poultry keeping, is an evidence of the rapid development of that branch of farm work.

I have the honour to be, sir,
Your obedient servant,
A. G. GILBERT.

Central Experimental Farm,
Ottawa, November 30, 1900.

REPORT ON THE WORK OF 1900.

The farmers of the country, with other poultry keepers, have, during the past two years, given more attention to the artificial hatching and rearing of chickens than ever before. As a result, during the past year a large number of letters have been received asking for information on the subject.

At present the artificial hatching and rearing of chickens is carried on in two ways, viz. :—

1.—By joint stock companies, with large plants, in charge of practical proprietors, or expert managers.

2.—By farmers and small poultry keepers, who use one or two incubators and outside brooders, and whose operations are comparatively limited.

In the first case, the aim of the companies is to make the egg product of the most value by converting it into early broilers, to sell at $1.25 to $1.50 per pair during the high-price season. In some cases operations are continued the greater part of the year. In others the sale of eggs from thoroughbred stock for hatching purposes in spring, and eggs for eating purposes during the winter time of high prices, are combined.

In the second case, the aim of the farmer seems to be :—

1. To raise as large a number of early chicks at the same period as possible, and so have them of uniform age.

2. By so doing to avoid comparatively late hatching by hens.

3. To secure a number of pullets, of same age, to make early layers.

4. To have a large number of early cockerels of uniform age to sell when prices are highest.

There are two methods by which the farmers may attain their object, viz. :—

By filling the incubator and beginning operations in late February, or, early March.

By deferring hatching operations until the middle of April, by which time the hens have had a run outside, and as a result their eggs will hatch better.

Experience has shown that there are difficulties to be met with, in the first method, in the shape of weak germs and weakling chickens, and that until a remedy is found for these obstacles, the farmers will find the second method slower, but certainly surer, in the attainment of their object. The difficulties in connection with the first or earlier method are enumerated and discussed further on, as well as investigation in connection with them, so far as made.

Up to date the experimental work in our poultry department has been conducted in connection with the early hatching of chickens by means of both hens and artificial means. The experience so far gained fully warrants the farmers in desiring some other means, than hens, by which to secure May chickens of uniform age and in paying quantity.

SOME POINTS IN FAVOUR OF SECOND METHOD.

In connection with the second method experience has shown that as soon as the snow is off the ground, and the hens have had a run out, that their eggs hatch satisfactorily. Unless the farmer has a brooding-house, which permits of his being independent of outside temperature, he will have to content himself with incubator and outside brooder. After the hens have had a run out, for some little time, the eggs are saved, the incubator filled, and the chickens hatched in first or second week in May. His outside brooder is placed on the rapidly growing grass, and with proper care and food the young chicks will be found to make famous progress. In this way

several farmers in the neighbourhood of Carleton Place, Ont., in May last, raised many hundreds of chickens. A visit to the farm of Mr. Alexander McLean, of Ramsay, near the town named, in the month of July last, showed 161 fine Barred Plymouth Rock chicks, and on the same day to the farm of Mr. Joseph Yuill, in the same locality, 350 fine chicks, also Barred Plymouth Rocks. Results were obtained in both cases by the successful operation of incubators, and outside brooders, by the wives of the farmers named The chickens in both cases made rapid growth, and in the latter instance were sold at the end of August to a Toronto fattening firm for 11 cents per pound live weight. Both were satisfactory instances of the second method, as outlined above, and recommended to farmers who use artificial means.

COULD THE SAME RESULTS HAVE BEEN SECURED WITH HENS ?

It may be said that the same results could have been secured by the use of hens. But experience has shown that it is almost impossible to get a sufficient number of broody hens early enough in the season wherewith to hatch out the number of chicks of the same age, so much desired. By the time a sufficient number of sitters could be secured under ordinary circumstances, the season would be advanced and the chickens unavoidably late. Again, the freedom of the chicks hatched and reared by artificial means, from lice, is a great factor in the rapid progress of the young chicks.

DIFFICULTIES MET WITH IN FIRST METHOD.

In connection with the first alternative, viz., the hatching of chicks from eggs laid by hens before the latter have had a run outside, the following experience has been gained:—For three seasons past an incubator of medium capacity was filled at the end of March with eggs obtained from hens, the majority of which had laid well during the winter season previous. The fowls were also in comparatively limited quarters and had been gently stimulated to lay. From the period of going into winter quarters—beginning of December until the snow went off the ground—it was impossible for them to run outside. The results obtained were most unsatisfactory, and the conclusion was arrived at that machines, condition of stock, methods, or men, or a combination, were at fault.

During the three seasons that observation was made of the eggs while hatching, and subsequently of those which did not hatch, results unmistakably showed :

1. A fairly satisfactory number of fertile eggs.

2. A large percentage of dead chicks in different stages of development from 10th to 18th days.

3. A number of fully developed chickens dead in the shell about pipping time.

4. That it was not so hard to get the fertilized egg, as the strong germs so necessary to hatch the robust chickens.

SIMILAR EXPERIENCE ELSEWHERE.

So important was it considered to ascertain the cause, or causes of the unsatisfactory results enumerated and to find a remedy therefor, if possible, that leave was asked for and obtained for the purpose of visiting the experts in charge of some of the large Canadian plants. A visit was first paid to the poultry department of the Ontario Agricultural College at Guelph, and the subject was thoroughly discussed with the manager of that department, Mr. W. R. Graham. His establishment embraced an incubator room, and commodious brooder-house of the most approved plans. His opportunity for investigation and observation was therefore exceptionally good. His experience was that early January eggs gave 50 per cent of results, but that later eggs were most unsatisfactory, and were so until the breeding stock had

run outside. He had taken steps to investigate the matter. His opinion was that the long confinement and continuous laying of the hens during their winter confinement, with lack of exercise, were predisposing causes.

Mr. Graham considered the matter of such importance that he accompanied me to the poultry department of the Massey Farm, East Toronto, and to the large poultry establishment of the Toronto Poultry and Garden Produce Company, at Eglington, North Toronto.

With these managers, views were exchanged, and the subject thoroughly discussed from its different standpoints.

The experience of these managers was similar to that of Mr. Graham, and my own, viz., that eggs from hens which had been confined to limited quarters, during winter, and were stimulated to lay during that period, had not given good results. The general opinion was that eggs laid by hens, properly mated, at the beginning of the season, late November or early December, would likely give better results than those laid at the end of the season. This opinion seems also to be that of the managers of the large broiler establishments of the Eastern States of America, who announce that with the view of securing a larger percentage of chickens than heretofore, that operations will commence this year in November, a month earlier than usual.

COMPARISON BETWEEN HEN AND INCUBATOR.

In order to make comparison between hens and incubators as hatching mediums, during the early season of the past two years, a number of eggs were put under the hens at the same time that others collected under the same conditions were placed in an incubator. The eggs were examined from time to time. The difference in the phases of progress were detected and finally the same percentage of fertile eggs were hatched. When the embryo was not robust enough to make progress, it died under hen as well as in incubator. This showed that the opinion entertained by some persons that eggs will hatch under a hen when they will not do so in an incubator, was not borne out by results in these trials.

CONCLUSIONS ARRIVED AT.

While scientific investigation into this important branch of poultry development will inevitably take time, observation and experimental work so far has shown :—

1. That early spring eggs from hens which have laid steadily all winter and have been gently stimulated to do so, are not likely to produce a satisfactory percentage of strong germs.

2. That eggs from the same hens after they have run outside give much better results.

3. That the condition of the laying stock at end of winter seems to be the source of trouble.

4. That investigation so far has not made clear the exact cause or causes of that condition.

INVESTIGATION COMMENCED.

Already scientific investigation in connection with the subject has commenced. In a bulletin issued by the Rhode Island (U.S.) Experiment Station, last spring, it is stated 'that in very many cases the loss of newly-hatched incubator chicks has been the sole obstacle to success.' And one of the principal causes is attributed to 'inherited

constitutional weakness.' And which may also be said to be the cause of so many chicks dying in the shell, near the hatching period. The foregoing conclusions seem to point to a faulty condition of the breeding stock, and to justify our own conclusions in that respect.

In our poultry department steps have been taken to ascertain whether the eggs of December will give stronger germs and more of them than those of early March, when the vitality of the laying stock is presumably less. With this object in view, two pens of eleven two-year old hens, and two of pullets, have been mated up. When sufficient eggs have been collected they will be placed in an incubator and results noted.

BREEDING PENS MADE UP.

On January 15 the following breeding pens were made up :—

Breeds.	Cocks.	Cockerels.	Hens.	Pullets.
Barred Plymouth Rocks	1	..	8	..
White Plymouth Rocks	1	..	7	..
Langshans	1	..	7	..
White Wyandottes	1	..	10	..
White Leghorns	1	..	8	..
Black Minorcas	..	1	8	..
Brown Leghorns	1	..	8	..
White Minorcas	1	..	5	..
White Indian Game	1	..	..	4

Crosses.

Light Brahma, male, mated with	4 Barred P. Rock hens.
Barred P. Rock, male, mated with	8 W. Leghorn pullets.

MANAGEMENT OF THE SITTERS.

When the hens became broody, they were set in wooden boxes placed in vacant pens of No. 2 house. The pens were 7 x 9 feet in size, and no more than four sitters were allotted to a pen. The wooden nest boxes contained no bottoms, and had a hinged door in front The nests were made of dry lawn clippings, which were found to answer the purpose much better than the cut straw used in previous years. Grain, grit and drink-water were constantly before the sitters. On being made, the nests were thoroughly dusted with a disinfecting powder, and so were the sitters, before being put on the nests. If the sitters are not so dusted at time of sitting, and during the hatching period of twenty-one days following, they are apt to become infested with vermin. It was found beneficial to place two or three china eggs in the nests as arranged and allow the broody hens to sit on them, for a day or two The sitters having proved reliable, the china eggs were removed and replaced by the valuable ones. In the case of borrowed sitters this will be found a wise precaution, as will also the thorough ridding of the birds of any vermin that might be on them. In the morning the doors of the nest boxes, which had been closed from the previous day, were opened and the sitters allowed opportunity to get out for food, water and a short run. In early spring, when the weather is likely to be cold, the sitter should return to her nest inside of ten minutes. Some space is given to the foregoing details because they are all important in the successful hatching of chickens by hens. Where incubators and brooders are used they do not, of course, apply. (*See* cut of nest box.)

The following list shows the number of eggs set under hens and result in chickens:

EGGS SET AND CHICKENS HATCHED

When Set.	Description of Eggs.	When Hatched.	No. of Chicks.
April 7..	6 B. P. Rocks, 7 W. P. Rocks	April 28..	2
" 20..	13 W. Wyandotte (from A. G. Goodacre, N.S.)	May 11..	11
" 20..	13 " " "	" 11..	11
May 2..	13 White Indian Games	" 23..	10
" 2..	13 " "	" 23..	6
" 3..	13 B. P. Rocks	" 24..	10
" 3..	13 Langshans	" 24..	7
" 3..	13 "	" 24..	8
" 3..	13 Buff Leghorns	" 24..	8
" 4..	13 "	" 25..	6
" 5..	13 Silver Laced Wyandottes	" 26..	11
" 10..	13 Andalusians (from Guelph, Ont.)	" 31..	8
" 10..	13 " "	" 31..	8
" 14..	13 " (from Rigaud, Que)	June 4..	6
" 14..	7 Andalusians, 6 W. Minorca	" 4..	6
" 19..	6 P. Rock—Brahma cross, 6 P. Rock—Leghorn	" 9..	5
" 19..	16 B. P. Rocks (from Guelph, Ont)	" 9..	5
" 19..	14 " "	" 9..	5
" 28..	13 B. Minorca (from Maxwell, Ont.)	" 18..	3
" 30..	13 W. P. Rocks (from Guelph, Ont.	" 20..	4
" 30..	13 Andalusians "	" 20..	9
	257 About 20 settings, average result about 58 per cent.		149
	Hatched by incubators		235
	Total		384

It will be noticed in the foregoing list that of twenty-six eggs from Grand Pré, N.S., twenty-two chickens hatched. Such results from eggs which had come so far were highly satisfactory and were indisputable evidence of strong germs, the result of robust breeding stock. Some of the later and smaller hatches were due to eggs more or less shaken up in transit or to clumsy sitters. The eggs from Nova Scotia were carefully and skilfully packed in a small box with egg compartments. Past experience, in obtaining eggs from a distance, has shown that the principal factors in obtaining satisfactory results are :

1.—Robust breeding stock, which give the strong germs.

2.—Fresh eggs.

3.—Careful selection and packing.

4.—Careful handling *en route*.

5.—Purchasing from experienced breeders.

On the part of the purchaser, care in hatching the eggs by natural or artificial means is also necessary. The responsibility does not altogether rest with the breeder who sells the eggs.

CARE AND GROWTH OF THE CHICKENS.

As in former years the late April and May hen-hatched chickens did the best. Experience has proved that the farmer who uses the natural means will get best results by having his chickens out in the first two weeks of May. In a previous page it has been shown where the wives of farmers have used incubators and brooders with great success in so doing. In the poultry department the chickens hatched by hens and incubators made satisfactory progress. In the case of the hen-hatched chickens the

Light Brahma and Plymouth Rock cross dressed for the home market. Seven months old, weight of the pair when killed, 8 lbs. 6 oz.

latter were permitted to remain in their nest for twenty-four or thirty-six hours, when with the mother hen they were placed in a slatted coop on the grass outside. The coop was so arranged that it could be securely closed at night while ventilation was secured. Through the slats the chicks could run on the grass outside, while the hen remained inside. On the floor of the coop was sand to the depth of two inches. On taking the mother hen from her nest she was given food and water. She had been probably thirty-six hours on the nest bringing out her chickens and deserved the attention. Apart from this she would be more likely to brood the chicks contentedly, after being fed, than if hungry or thirsty. How important it is to have early chicks carefully brooded is well known to all experienced breeders. The rations and treatment of former years were adopted, viz., stale bread crumbs followed by stale bread soaked in milk and squeezed dry. This for a day or two, when granulated oatmeal was given. Crushed corn was not given until after eight days, and whole wheat was not fed until twelfth or fourteenth day. As the chicks grew, a mash composed of shorts, cornmeal, stale bred and a small quantity of prepared meat was mixed with boiling skim milk, allowed to cool and was given three or four times per day. Occasionally small potatoes were boiled and mixed into the mash. Milk and water were both furnished for drink.

The incubator-hatched chickens were allowed to remain in the nursery of the machines for twenty-four or thirty-six hours when they were put in the brooders outside. The chicks were fed the same rations as those outlined above.

WEIGHTS OF CHICKENS.

On the above rations the chickens made the following development :—

No. 6—B. Rock	cockerel,	hatched	April 28,	weighed	August	11, 3 lbs. 8 oz.—	September	11, 5 lbs. $3\frac{1}{2}$ oz.
74—W. Wy	"	"	May 11	"	"	11, 3 " 10 "	"	11, 5 " 6 "
78 "	"	"	" 11	"	"	11, 3 " 3 "	"	11, 4 " 10 "
68 "	"	"	" 11	"	"	11, 2 " 15 "	"	11, 4 " 5 "
59 "	"	"	" 11	"	"	11, 2 " 14 "	"	11, 4 " 6 "
49 "	"	"	" 11	"	"	11, 3 " 1 "	"	11, 4 " 4 "
3—B. Rock	"	"	" 11	"	"	11, 3 " 1 "	"	11, 4 " 14 "
73 "	"	"	" 24	"	"	11, 2 " 13 "	"	11, 4 " 11 "
5 "	"	"	" 24	"	"	11, 2 " 15 "	"	11, 4 " 4 "
52 "	"	"	" 24	"	"	11, 2 " 10 "	"	11, 4 " 3 "
"	"	"	June 9	"	"	11	"	11, 3 " 10 "
"	"	"	" 9	"	"	11	"	11, 3 " 8 "
"	"	"	" 9	"	"	11	"	11, 3 " 10 "

A cross of Light Brahma, male, and Barred Plymouth Rock, female, produced fine, large, hardy birds, which grew rapidly and made flesh quickly. It was one of the best crosses tried in our department.

Three cockerels of the above cross hatched by incubator on June 9 and 16 weighed when killed on December 18, 8 pounds 6 ounces, 8 pounds 5 ounces, and 6 pounds 8 ounces, respectively. The plate on frontispiece shows the appearance the birds presented when dressed for market.

EGGS LAID BY DIFFERENT BREEDS IN SIX AND A HALF MONTHS.

Breeds.	From December.	January.	February.	March.	April.	May.	June.	Up to 6th July when hens ran outside.	Totals.
12 B. P. Rock hens	18	44	38	83	95	36	32	12	358
10 " pullets	24	57	75	112	90	75	60	14	507
8 White Leghorn hens	18	34	33	66	119	106	127	25	528
8 " pullets	56	127	116	97	104	51	103	9	663
8 Black Minorca hens	37	79	91	124	113	109	120	16	680
9 " pullets	30	116	140	119	119	87	97	4	712
3 Andalusian hens	15	42	26	38	25	37	26	7	216
8 Langshan hens	36	125	104	95	136	125	71	12	704
10 W. P. R. hens	29	67	83	84	68	33	34	8	406
9 " pullets	19	32	35	54	59	46	87	4	336
10 White Wyandotte hens	26	66	70	81	55	42	6	5	351
9 " pullets	6	83	105	71	47	32	41	....	385
6 Coloured Dorking hens	30	41	41	57	......	Sold.	......	....	169
6 Buff Leghorn hens	37	54	49	54	83	57	95	11	440
12 Mixed hens	79	92	82	106	71	73	89	10	602
9 " pullets	......	56	71	67	67	68	79	8	416
8 Brown Leghorn hens	65	110	103	123	123	109	133	10	776
9 " pullets	74	125	111	124	94	97	102	19	746
5 White Minorca hens	29	32	47	39	50	40	44	5	286
8 " pullets	28	45	54	41	60	27	40	5	300
4 White Indian Game	......	14	73	58	61	29	39	5	279
12 P. R. W. Leg. cross	2	75	136	92	112	95	110	13	635
	658	1,516	1,683	1,785	1,751	1,365	1,535	202	10,495

The hens named in above table were under two years of age.

WHEN THE PULLETS COMMENCED TO LAY.

Barred P. Pullet (hatched May 24)................	December 6
White " (hatched May 26)................	" 4
Buff Leghorn Pullet (hatched June 16)............	" 2
Langshan Pullet (hatched May 24)..................	" 24
White Wyandotte Pullet (hatched May 11)..........	" 24

WHEN WINTER LAYING COMMENCED.

The winter season was unusually early and the snowfall of the middle of November compelled the closing in of the laying stock at that period. The birds were in good health and condition with the exception of the Langshan and White Plymouth Rock hens, several of which had not completely got over their moult. The first hens to lay were Barred and White Plymouth Rocks, Brown and White Leghorns, and Black Minorcas. Winter laying commenced 18th November.

NUMBER OF EGGS LAID DURING YEAR.

December, 1899....................	658
January, 1900.....................	1,516
February..........................	1,683
March.............................	1,785
April.............................	1,751
May...............................	1,365
June..............................	1,535
July..............................	1,089
August............................	661
September.........................	438
October...........................	221
November..........................	176
	12,878

PRICE OF EGGS DURING YEAR.

The price of new laid eggs during the year was unusually good, particularly so during the summer months. In the midsummer months the average price per dozen was 15 cents. In the fall months from 18 to 25 cents were the prevailing figures on the market. In many instances private parties sold at the latter price much earlier in the season.

STOCK ON HAND.

On December 8, 1900, the following old and young stock were on hand :—

	Cocks.	Cockerels.	Hens.	Pullets
Barred P. Rocks	2	..	13	29
White "	1	..	9	7
Langshans	1	7	10	10
Coloured Dorkings	..	..	2	..
White Wyandottes	1	1	4	12
White Leghorns	1	..	10	..
Brown "	1	..	15	..
Buff "	1	2	6	11
Black Minorcas	..	..	12	5
White "	1	..	6	..
Andalusians	..	3	3	6
Indian Games	..	3	4	4
Crosses	..	..	12	12
	9	16	106	96

DISEASES OF POULTRY.

Inquiries as to poultry ailments have not been as numerous in recent, as in previous years, no doubt the result of better methods of care and treatment. The symptoms of the comparatively few cases described during the past year pointed to liver derangement of some sort, no doubt the result of overfeeding hens of older age than they should have been allowed to attain.

Germ Diseases.—In all cases of germ diseases the best and simplest treatment was advised, as well as the separation of the ailing birds from the well ones, and the thorough disinfection of the premises, after recovery. Indeed, as a precautionary measure, it is well to thoroughly disinfect the fowl-house once or twice every year.

Lice.—In several instances a remedy for lice-infected fowls and premises was asked for and given. In the case of fowls in limited number—one of the many forms of carbolic powder was recommended. When in large numbers one of the liquid preparations was advised as the most speedy way in which to meet the difficulty. These liquid lice-destroying preparations have, in recent years, been put upon the market and are said to be efficient. For red mites the remedy published in report of last year was advised, as follows :—A solution of

Corrosive sublimate	4 ounces
Common salt	4 "

Dissolve in two to four quarts of water. When completely dissolved dilute to 25 gallons.

With this carefully spray every crevice, nook and corner of the house, first removing and burning all movable wood parts.

As the solution is highly poisonous, care should be observed in handling it.

Follow by whitewashing the premises. Before returning the fowls to the poultry-house see that they are entirely free from vermin.

EXPERIMENTS IN THE PRESERVATION OF EGGS.

The following interesting results of experiments in the preservation of eggs by Mr. F. T. Shutt, Chemist to the Experimental Farms, is a continuation of the work begun by him three years ago. Full details of investigation, up to that period, are given in the report of the Poultry Department of last year, beginning at page 223. The results, as given in last year's report, have been widely copied and are yet the subject of much inquiry.

OTTAWA, December 29, 1900.

(The Preservation of Eggs by Frank T. Shutt, M.A.)

In the report for 1899 (page 223 *et seq.*) will be found a record of the results obtained, in two series of the experiments with certain solutions as egg preservatives. The preservatives employed were saturated lime-water, lime-water plus 10 per cent of common salt, 10 per cent solution of water glass (sodium silicate), 5 per cent glycerine, and distilled water. The coating of the eggs with paraffin was also tried. After a careful examination of the eggs, including poaching, we concluded that saturated lime-water gave by far the best results.

During the past year we have repeated several of the above mentioned trials and also tested the efficacy of certain other methods for egg preservation that have received attention from time to time in the press. The experiment was begun on June 5, and the eggs examined on December 10.

Three eggs from each experiment were poached.

Briefly stated, our results are as follows :—

A.—Eggs immersed continuously in saturated lime-water. Outward appearance, excellent ; yolks, non-adherent, of good colour and fairly globular ; albumin, somewhat more limpid than in fresh eggs, and slightly discoloured ; a very slight 'stale' odour ; air space, normal ; poached eggs free from all objectionable taste and of good appearance.

B.—Eggs first smeared with vaseline and immersed continuously in lime-water. Externally, somewhat darker than the foregoing and rather greasy ; yolk, globular and of good colour ; albumin, a very faint yellowish tint and somewhat limpid ; a very slight 'stale' odour ; air space, normal ; poached egg very similar to that in 'A.'

C.—Eggs continuously immersed in 2 per cent silicate of soda. External appearance good and very similar to that of eggs in lime-water ; yolk, globular and of good colour ; albumin, but very slightly discoloured, almost normal ; marked odour of a 'soapy' character which is further developed in poaching ; air space, normal ; poached egg, of very good appearance, but with faint 'stale' flavour.

D.—Eggs continuously immersed in solution of 5 per cent of gum arabic and 1 per cent formalin. Outward appearance, inferior to those in foregoing tests ; yolks, attached to shell ; albumin, decidedly discoloured ; odour, not marked ; air space, normal ; appearance of broken egg much inferior to those in preceding test ; developing marked flavour on poaching.

E.—Eggs continuously immersed in 5 per cent gum arabic plus 5 per cent salicylic acid. Preservative solution quite mouldy and with a very bad smell. Egg-shells quite soft. The broken egg, though not unsightly, had a most nauseating odour and was quite unfit for food.

F.—Eggs continuously immersed in 5 per cent dextrin plus 5 per cent salicylic acid. Preservative solution very mouldy and smelling badly. Egg-shells soft, and contents unfit for food.

G. Eggs dipped momentarily in dilute sulphuric acid, then washed and stored in a large bottle. All exceedingly bad ; contents very offensive.

H.—Eggs dipped momentarily in sulphuric acid, washed and dipped in alkaline ammonium oxalate, then stored in large bottle. All the eggs very bad and contents offensive.

These experiments corroborate many of the results obtained last year, and give further proof of the excellence of the eggs preserved in saturated lime-water. We think that, on the whole, 2 per cent sodium silicate gives better results than the 10 per cent solution experimented with last year, but we are also of the opinion that lime-water is superior to both as an egg preservative. Moreover, it is cheaper and pleasanter to handle.

GENERAL INFORMATION

ON POINTS IN POULTRY KEEPING ASKED FOR BY NUMEROUS FARMER CORRESPONDENTS AND OTHERS.

Notwithstanding the large amount of information that has been distributed throughout the country, in relation to poultry-keeping in all its different phases by our experimental farm reports, during the past twelve years, there is yet a very great demand for further information on the subject. Poultry keeping by farmers and others is evidently making rapid development, hence the demand.

It is of primary importance that beginners should understand that successful poultry keeping is dependent upon the following conditions :—

A knowledge of the business.

A suitable house.

The proper breeds.

Proper number of fowls.

Suitable food and treatment.

Fowls of proper age.

Care and proper treatment of chicks from time of hatching.

A KNOWLEDGE OF THE BUSINESS.

In the world of commerce a knowledge of the business engaged in is considered necessary to success. Poultry keeping for profit is no exception to this rule. Letters are frequently received from correspondents to the following effect, 'that the writer has been engaged in the dry goods, or other business, in the prosecution of which he has lost his health. Being of the opinion that poultry keeping will be a means of restoring his health and making a livelihood, he desires to know quantity of land, quantity of grain to be grown, number of fowls, &c., necessary for success.' It is evident that the undertaking in the case of such a correspondent would be that of a specialist, which is the most advanced branch of poultry keeping. To ensure success, capital, a large plant and expert knowledge would be necessary. Such expert knowledge could be learned by attending one of the agricultural colleges, where a course of poultry keeping is taught, or by serving an apprenticeship at one of the large poultry plants. The knowledge might certainly be gained by experience, which would necessarily be lengthy and costly.

THE POSITION OF THE FARMER.

The position of the farmer is entirely different. It is essentially his business. He has already a certain knowledge of live stock, in the majority of cases of poultry keeping. His stock may not be thoroughbreds, his poultry house not of the latest or best pattern. But these are obstacles which can quickly and cheaply be removed. He has the grain, the green food and other essentials in abundance, in many cases almost in the shape of waste. To him the information contained in this and other experimental farm reports, is of the greatest value, because it can be, as it has already been in many instances, so easily converted into satisfactory results.

A SUITABLE HOUSE AND CONTENTS.

There is really no cast-iron rule as to the building of a poultry house, for conditions vary so much in different parts of the Dominion. But there are certain guiding rules that should be followed, viz. :—

As much light as possible.
A moderately comfortable temperature, say 40°.
As much room as possible.
The disturbance of the laying stock as little as possible.

The poultry house should face the south, with a window in that part—a double one in very cold regions—so that the sun can shine through it during the winter time. A board floor has been found best, because an earth one, if it becomes damp, which it is likely to do in cold weather, will remain so all winter. Again, unless frequently raked over, the loose top earth removed and renewed, it will probably become foul, and be the source of disease. On the board floor should be litter, composed of straw, oat hulls, cut leaves, &c., and this should be removed and renewed from time to time. The passage-way, if size of house requires one, should be on the north side, and the front of the pens so arranged that the collecting of the eggs, cleaning of the platform, the feeding of the soft food and watering should all be done from the passage-way. This arrangement will much lessen the disturbance of the laying stock. Where it is possible to have a small pen for roosting and laying in, and a larger one, alongside, for a living and scratching room, the laying stock will be still less disturbed. By this plan, when the litter on the floor of one pen is being removed, the fowls can go into the other pen. Birds of the Mediterranean family are particularly sensitive to disturbance. The nests should be dark and secluded. Darkened and secluded nests tend to prevent egg eating, a vice much easier prevented than cured.

A dust bath in the shape of a square box, 5 x 5 feet, larger or smaller, according to the number of hens, is necessary. It should contain dry earth, or earth mixed with fine soft wood, or coal ashes, so that the fowls may dust themselves in it and keep their bodies free from vermin. Other articles requisite are a small box, 8 x 4 inches, to hold grit in one compartment, and oyster shells, or other form of lime, in the other, and a drinking fountain. A narrow trough, 6 or 8 feet in length by 3½ inches in width, is also necessary for the feeding of the cut bone or mash, whether this is done from the passage-way or inside the pen. No less than 6 square feet should be allowed to each fowl. A temperature of 40° is about the correct one. A correspondent in Winnipeg writes that he got best results from a temperature of 40 or 45 degrees. The birds should be divided into colonies of 15, 20 or 25 each. They will be found to give best results in small numbers, with plenty of room.

The poultry building should be kept clean and free from vermin. If disease is discovered among the fowls, the sick ones should at once be removed and the premises thoroughly disinfected. It is a good plan to disinfect and whitewash the house once or twice every year. The roosts should be kept dampened with coal oil. Scaly leg and the lodgment of lice are so prevented. Coal oil should be freely but discreetly used about nests, roosts, platforms, and wherever lice are likely to make lodgment.

THE PROPER BREEDS FOR THE FARMER.

The farmer evidently desires fowls which will give him eggs in winter, and later on rapid flesh-forming chicks. Both results may be secured by means of Plymouth Rocks or Wyandottes. This is not said with prejudice to other breeds. Of the two breeds named, Barred Plymouth Rocks and White Wyandottes are given first choice, not only on account of their good qualities, but because they can be had almost in any locality and at cheap prices. Experimental work, extending over many years, has shown that Barred Plymouth Rock pullets lay as well as any others. With proper care and feeding, from time of hatching, a pair of Barred Plymouth Rock cockerels should weigh, at the end of four months, 8 or 8½ pounds. White Wyandottes have low combs and a blocky flesh-carrying body, and for those reasons make excellent fowls for the farmer. Mr. A. G. Goodacre, of Grand Pré, N.S., writes that his strain of White Wyandotte hens laid eggs, seven of which weighed one pound. As to flesh development, the weights are given, in a previous page, of a number of cockerels hatched from eggs obtained from Mr. Goodacre. The characteristics of both Barred Rocks and White Wyandottes, with those of other standard breeds, are given in a following page.

PROPER NUMBER OF FOWLS.

From 100 to 150 hens should not overtax the resources or energy of the ordinary farmer. If he has help from wife and family, as many have, a greater number may be profitably kept. But it is not desirable, under any circumstance, to have more hens than can receive the care and attention so necessary for success. With judicious management and treatment of his stock, and proper sale of their products in eggs and chickens, each hen should yield a profit of $1 to $1.50 per year, over and above expenses of feed, which to a farmer should not be more than 75 cents per head for the same time.

SUITABLE FOOD AND TREATMENT.

In the preparation of the winter rations, calculated to incite their fowls to egg laying during that season, farmers should find opportunity to utilize much of the waste of their farms. The mash affords a means of doing so, as will be apparent in the following list of rations, which afford liberal range for choice, not only to farmers but to others.

RATION 1.—SUITABLE FOR USE BY FARMERS.

Morning.—Mash of whatever ground grains are in greatest abundance and cheapest, mixed with potatoes, turnips or carrots, boiled. Many of the vegetables named are in the shape of waste, and may be made good use of in this way. Add a small quantity of black pepper and a few pinches of salt, and mix into crumbly condition. Feed three mornings or afternoons of the week. For proportions in which to feed, see Ration 5. The mash may be varied occasionally by mixing in clover hay in lieu of the boiled vegetables. The clover hay should be well steamed before being used. After feeding scatter two or three handsfull of oats in the litter on the floor of the pens to start the hens to exercise in searching for it. Other three mornings of the week feed cut bone or meat in some shape. When mash or cut bone are fed in the afternoon, feed grain in the morning instead.

Noon.—A little more grain to keep hens in exercise.

Afternoon.—This ration should be thrown in the litter on the floor, before it is too dark, and should be fed in such quantity as to send the fowls to roost with a full crop. Wheat is the best grain. Buckwheat is excellent.

RATION 2.

Morning.—Two parts of ground oats, one part shorts, one part cornmeal, and a small quantity of animal meal. The latter should be omitted when cut bone is fed. Mix with hot water into mash and feed three times per week, morning or afternoon. Dust in small quantity of black pepper and salt. Other mornings, cut bone or other form of meat. When mashed or cut bone is fed in the afternoon, grain should be fed instead at morning ration.

RATION 3.

Morning.—Mix into mash, wheat bran, 2 parts; ground oats, 1½ parts; cornmeal, ⅛th part. Season with salt and add half a teaspoonful of black pepper. Feed three times per week. Start hens to exercise.

Noon.—Small quantity of grain to keep fowls searching for it.

Afternoon.—Same as No. 1.

The above ration is recommended for egg production by Mrs. Judy, a well known poultry keeper and writer on poultry subjects.

RATION 4.

The following ration was fed to a pen of White Plymouth Rocks, owned by Dr. W. S. Stevens, of McChanistown, Ohio, and which pen won the prize offered by the National Stockman, three years ago, for the largest yield of eggs per hen during the year. The average number of eggs per hen is given at 289.

Morning.—Equal parts of bran, wheat middlings, chopped corn and oats, with some fine beef meal mixed in and the whole made into mash.

Noon.—Wheat was thrown into the litter on the floor of the scratching shed to keep hens busy.

Evening.—Whole corn.

From April 1 to November 1 the same was fed, except that the morning mash was mixed with cold water and wheat was given instead of corn. The greatest of cleanliness was observed.

It will be noticed in the above that the fowls had access to a scratching shed, which climatic conditions permitted, and by which they received the benefits of change of air and exercise during the winter season.

RATION 5

The following ration and manner of feeding it has been found effective in our poultry department :—

Mash—Shorts	2 parts
Ground oats	1 "
Cornmeal	1 "
Small potatoes boiled	¼ "

The whole mixed with boiling water into a crumbly condition. This was fed in proportion of one quart (Imperial), weighed dry, to 15 hens, three times per week, in morning or afternoon. A little was fed to the pullets every day, but was found at end of January to be fattening the Barred Plymouth Rocks, and the feeding was reduced to three times per week and to the same quantity as fed to the hens. Cut bone in proportion of 1 pound to every 15 hens other mornings, or, afternoons when mash was not fed.

At 11 a.m., steamed lawn clippings were given in moderate quantity and were eaten with great relish. If fed too frequently, or in too great quantity they were found to make the hens crop-bound.

At noon a light feed of oats (5 pounds to every 100 layers) was thrown into the litter on the floors of the pens, to incite the fowls to continued exercise.

For afternoon ration, 8 to 10 pounds of wheat to every 100 hens was thrown into the litter and the fowls seemed to make active search for it.

Mangels were found to be the cheapest and most convenient form of green food, and were before the layers at all times and so were grit and crushed oyster-shells. Pure drink water was in abundance.

PROPER QUANTITIES TO FEED.

This has been found a very difficult matter to decide. Experience has shown that proportions of food that have answered in one case have not done well in another. Again, pullets have done well and given good results on a ration that would certainly have put older hens out of condition. Careful experiment, extending over a period of some years, with rations fed in different quantities, to different lots of hens, is requisite to lead to definite quantities.

Experience in feeding winter rations during past years has shown very clearly the following :—

1.—That variety in the rations and time of feeding are beneficial.

2.—That where there is such variety there are neither egg-eating nor feather-picking.

3.—That pullets will do well on rations, which, if fed in same quantity to old hens of the Asiatic or American breeds, will end fatally.

4.—That sameness in rations and too heavy feeding are likely to cause *enteritis* or inflammation of the intestines. (See report of 1897.)

The method of feeding adopted in our poultry department for some years past, has been with a view of avoiding over-feeding, and the evils resulting from it; simplicity and cheapness of rations, and affording variety which has been found to be the very spice of poultry life. Correspondents have said that amount of mash as advised in reports of 1897 and 1898 was not enough for winter use. Others have said that heat was the chief factor in obtaining the eggs. It is quite possible to have been under rather than over the mark, and it is equally probable that with artificial heat a less quantity of food had been found effective. In a cold poultry house more food would be required to get the same results as had been attained in a moderately warm one. Which goes to show the benefit of a temperature in a poultry building of not lower than 40 degrees, as advised in this and previous reports. And under ordinary climatic conditions, and in a well-conducted house, it might be possible to obtain such a temperature without artificial means.

FOWLS OF PROPER AGE.

Experience has shown that it is not advisable to keep fowls of the heavy breeds over two years of age for the reasons that if kept until older they are apt to moult late and to put on fat easily. In the case of Leghorns, Minorcas, Andalusians and Hamburgs the birds may be kept until three years old. A simple and efficient way of keeping trace of the age of a fowl is to put a ring, made of wire, on one of her legs for each year of her life.

PROPER CARE AND MANAGEMENT OF CHICKENS.

Full particulars as to the proper care and management of sitting hens and of the chicks hatched by them will be found on a preceding page.

FATTENING OF THE CHICKENS.

If the chickens receive the attention and food as outlined, they should be ready to be sold to any of the large establishments which purchase chickens to fatten, and ship to the English market, or the farmer may prefer to dispose of them to special customers in the large cities, or, if he has them in sufficient numbers he may prefer to ship them to the agent of the Department of Agriculture in London, England, Mr. A. W. Grindley, first notifying the Commissioner of Agriculture and Dairying of such intention in order that arrangements may be made for their transmission by cold storage.

Should the farmer desire to specially fatten his chickens before sale, or shipment, his simplest and speediest plan is to put his birds at 3½, 4 or 4½ months of age, in slatted coops or crates divided into compartments to hold one, or a number of birds up to four. These coops should have V-shaped feeding troughs in front. The following fattening ration has been found most effective in our poultry department, viz. :—

Two parts finely ground oats.

One part finely ground barley.

One part ordinarily ground cornmeal.

After 15th day add beef suet in proportion of one ounce to every four birds. Mix with skim-milk. If the milk is made near the boiling point the tallow, which should be chopped fine, will be melted by it when poured on the ground grains. Or the tallow may be melted in the hot milk. The birds should be fed all they will eat twice a day. Carefully collect all uneaten food. Leave none to turn sour, and feed none in that condition.

Care should be taken to free the birds from vermin before cooping. This may be done by rubbing sulphur well into the feathers, or by one of the lice-exterminating powders.

Pens and premises should be kept scrupulously clean.

Grit and water should be supplied regularly. Three weeks should be sufficient to fatten the birds satisfactorily.

METHODS OF FATTENING ADOPTED BY FARMERS.

Several farmers have sent their methods of and foods used in fattening chickens. Some of them are given as follows :—

Mr. A. McPhadden, of Dominionville, Ont., states that his crates are made of common building lath, 4 feet long, divided into two compartments, with the bottom laths planed. Four chicks were put in each compartment.

Rations for first week were composed of 3 parts oats, 1 part pease.

Second week—Same as first, with a little cornmeal added.

Third week—Quantity of cornmeal was increased.

Three weeks' fattening was sufficient.

Cost of one pound flesh production, 5½ cents.

Mr. James Watson, of Sonya, Ont., described the rations used by him as follows :—

Two parts finely ground oats.

One part finely ground barley.

Mixed with skim-milk and fed 3 times per day for 3 weeks.

Thirty B. P. Rock cockerels weighing 167 pounds were put into crates on October 22, and fed on above rations. Gain made in first week, 24 pounds ; second week, 20 pounds ; third week, 12½ pounds. Cost of producing one pound of flesh, 5¼ cents.

Messrs. Armstrong Bros., of Fergus, Ont., describe the following as rations used by them :—

Morning—Two-fifths ground corn ; two-fifths wheat bran ; one-fifth wheat middlings. Fed 3 mornings. Other mornings ground oil cake was mixed into mash. Noon—Boiled potatoes and stale bread. Afternoon—Immediately after noon ration was eaten, the troughs were cleaned and filled with whole corn and wheat. This was allowed to remain before the birds for the rest of the day.

The birds were placed in slatted coops 16 x 20, and in each compartment 3 to 4 were put. Feeding lasted for nineteen days. Average gain, 1½ pounds each. During last week very little soft food was given. Water and grit were regularly supplied. No milk was used.

As showing the good results from careful attention to and proper feeding of the chicks from time of hatching until they were able to eat a mash of ground grains, a lady states that she had four Barred P. Rock cockerels weigh at end of three months respectively, 4 pounds ; 4 pounds ; 4½ pounds. Their soft food was composed of shorts, cornmeal, with the waste of the table and kitchen. No more than 5 pounds of hard grain wére given.

THE FORCING METHOD.

Mr. Ernest Cobb, an English writer on poultry subjects, gives the following rules as observed in the large fattening establishments in England :—

When the purchased birds arrived they are placed by themselves in coops, separate from those being forced. They are called 'feeders.'

After being cooped the feeders are allowed no food for twenty-four hours.

After this short fast they are fed from V-shaped troughs—which are suspended in front of their coops—three times per day, all they can eat, of a thin mash, composed of finely ground oats, mixed with half water and half milk.

During the second week the water is gradually replaced by milk.

At end of second week a little fat is melted in the hot milk and mixed in the food.

At end of second week, perhaps a short time before, the birds do not eat as readily as they did and the 'crammer' or forcing machine is called into requisition.

The ration, as used in the 'crammer,' is ground oats and skim milk, sweet or sour, the latter preferred, to which is added fat (tallow in most cases) in proportion of a tablespoonful to each bird.

The mixture as used in the 'crammer' is of the consistency of gruel or thin porridge.

The same authority also says that the 'feeders' should be kept going (by hand-feeding) as long as they continue to put on weight. A bird should never be placed on the 'crammer' so long as it eats heartily. Experience has shown that after ten days or a fortnight most birds will not take enough food voluntarily to make weight. It is then that the forcing machine is brought in requisition.

English fatteners prefer finely-ground oats to any other kind of ground grain. Ground barley has been found too heating. Cornmeal puts on yellow fat and tends to give a tinge of that colour to the skin, which is very objectionable to the English buyer. In the United States a yellow skin is rather preferred , while it seems a matter of indifference to Canadian purchasers.

The birds are not allowed any food for twenty-four hours before being killed ; the object is to have no food in the crop to decompose.

MANNER OF KILLING.

Birds intended for shipment to the English market should be killed by having their necks dislocated. When the bird is properly killed in this way the end of the neck should be two inches away from the head. After killing and during plucking the bird should be so held that its head will hang downwards, thus affording opportunity for the blood to drain towards and coagulate in the neck.

Another manner of killing is by cutting the roof of the mouth, at the base of the brain, lengthways and across, with a narrow-bladed and sharp knife, but birds so killed should only be sold on a local market.

PLUCKING.

Immediately after the neck is broken all sense of feeling ceases, and plucking should at once begin and be carefully done. On no account should the skin be torn or bruised in anyway. Mr. E. Cobb, the English authority already quoted, thus describes the operation : 'The immediate plucking of the bird is advocated because the feathers come away ten times easier directly after killing than if the bird is left alone for one minute only before starting. Many fatters never employ the thumb in plucking, excepting at a few places, and prefer slipping, as it were, one finger under the feathers and catching them as in a vice between the other fingers. Having cleared the neck down to within a couple of inches or so of the head, pluck the sides of the breast and the top of the back level with the wings, then do the wings, and work down the back to the tail, extract the latter, and, turning the bird over, finish up at the point that you left off on the breast, taking the legs on the way down.'

SINGEING

Many of the English fatters singe their fowls. This should be done immediately after plucking and before the body is cold. It should be carefully done, so as not to burn the flesh. All the 'pin' feathers should also be carefully removed. The bird is now ready to be pressed.

The English practice before putting the bird into the 'press' is to tie the hocks together above the shank. The pressing machine is made by placing a board against a wall at an angle of 65 degrees. Or it may be made in the shape of a stand. In the latter shape it is made by placing two boards together at right angles. The birds are then placed breasts downwards, with sterns pressed against the wall, or slanting board and heads hanging downwards. A weight is placed on the backs of the chickens, so as to press their breast bones in flat, slightly crushing them in without breaking them. In the evidence of the Commissioner of Agriculture and Dairying, before the Agricultural Committee of the House of Commons, the operation is thus described : 'a glazed brick or other weight is laid on top, and another brick is put alongside to keep it in position until the next bird is pressed closely there. After the row is full the chickens are left lying on their breasts with a board laid on top of them, with sufficient weight to hold them firmly and crush the breast bones slightly'

The birds should be left in the press from two to six hours, at any rate until thoroughly cooled.

PACKING.

For shipment to England, the birds should be neatly packed in lightly made but strong cases or boxes, to hold twelve birds, six in the bottom of the case and six on top of the lower tier. The birds should be wrapped in clean white paper, and arranged so as to present a neat appearance on being unpacked. In packing, the heads of three birds should be at one end of the case and the feet at the other end. The other three birds should be arranged the opposite way, and so that they will neatly fit in.

TURKEYS.

THE BEST BREED FOR THE FARMERS—HOW TO KILL, PLUCK, DRESS AND PACK.

The *Fish Trades' Gazette, Poultry, Game and Provision Chronicle,* of London, England, speaks of Canadian turkeys as 'splendid birds, being equal to, if not superior, to the fine birds from the continent.' The same paper says that the styles of plucking, dressing and packing have much improved, and as a result a large trade in Canadian poultry, not only at Christmas, but at other times, is likely.

To comply with the conditions of the English market, it is of paramount importance that the birds be of the best quality. Next, that they are plucked, dressed and packed according to the best methods.

It is of first importance that our farmers breed the largest, best and hardiest birds. Climatic conditions, in the greater part of Canada, are favourable to the breeding of a large number of turkeys, indeed of all kinds of poultry. There are six varieties of turkeys, viz. :—Bronze, Narragansett, White, Black, Buff and Slate. Of these the Bronze are the largest and heaviest. The standard weights of this variety are :—

Cock....	36 pounds.	Hen....	20 pounds.
Cockerel....	25 "	Pullet .	16 "

The first requisite in successful breeding is strong, vigorous parent stock. Inbreeding should be avoided. It is admissable to use a good male two years, but not so to use a young male and pullets of the same family. Young hens weighing 15 to 18 pounds, and older ones of 18 to 20 pounds weight, are the best layers, and make the best mothers. One male with 10 or 12 hens is a good mating.

Some turkey hens lay more eggs than others. Eighteen to twenty-four eggs from each hen should be satisfactory. The turkey hen makes the best mother, although some breeders give the first seven eggs to a common hen. The objection to the latter is that she is apt to drag the young pullets too much about.

Twenty-five young birds are all that the turkey mother can keep dry and warm.

It is of first importance to keep the young birds in dry quarters. Great care is necessary in rearing them until they 'shoot the red,' (get wattles, &c.). It must be borne in mind that young turkeys before 'shooting the red,' are the most tender of all feathered fowl, and afterwards the hardiest.

Too early setting is not advisable in this latitude. Where the winters are milder and spring earlier it is different.

After hatching, the youngsters and their mother should be put in comfortable, dry quarters. Give a grass run if possible. The coop should be roomy, and so conveniently situated that mother and brood can easily be driven into it, in case of rain. Care should be taken that mother and brood do not get into the grass while wet with the morning dew. It is important to remember this. It is also well to remember that experienced breeders have traced the death of many young birds, in their early handling of them, to damp quarters, lice and indigestion, the latter probably from eating uncooked food. Unclean, carelessly mixed and uncooked food has been the cause of death in the case of many young and tender birds. The mortality among young turkeys, from one end of the country to the other, is far too great and is principally caused by neglect of the points outlined above.

PROPER RATIONS.

For the first few days feed on stale bread soaked in milk and squeezed dry. Mix with hard boiled eggs and onions, both chopped finely. Curd or a sort of cheese made from sour milk may also be given.

Later on feed on granulated oatmeal, rolled oats, or a mash made of stale bread, onion tops, oatmeal, cornmeal or middlings, the whole mixed with skim-milk. The milk should be boiled and a little black pepper dusted into it, before putting it into the mash.

For the first five or six weeks feed four times daily. Afterwards three times.

At the time of 'putting on the red,' uncooked food should not be fed. At this period the young birds are likely to eat ravenously, but on no account should they be allowed to gorge themselves. After becoming fully feathered they require nothing but hard grain.

Turkeys are fond of roaming, and often wander away from headquarters. In this way many are killed by weasels, skunks and other enemies.

A good plan is to feed the hens and their broods grain every evening, and so accustom them to coming home. This, of course, when the young birds have reached the proper age.

TO FATTEN.

Birds may be fattened as in the case of chickens while running outside, or by being penned up and specially fed. Success has attended the fattening of turkeys in many instances, by the forcing method. But with the right breed in the first instance, care and proper food, there should be no difficulty in obtaining the desired flesh development.

KILLING.

The birds intended for shipment to Great Britain are killed in the same manner as chickens, by dislocation of the neck. Care is necessary in having this properly done, as the following note of warning from a London poultry purchasing firm to an Australian agent, shows :—

'Having purchased the several consignements of frozen poultry which you have had on show in the exhibition, I have written you our opinion of same. A, the quality very good ; B, trussing very good; C, packing well done ; D, killing may be capable of being very much improved on, as the necks of the birds are invariably very much discoloured, and appear almost unsaleable through this. I would suggest bleeding at the mouth, and not so much force used in dislocating the neck. I consider there is a good market here for your poultry, if you can send it, say, to arrive in England continuously from January to June.'

It is not likely that bleeding at the mouth will be adopted by those firms who ship in large numbers. But if this manner of killing is adopted, it should be done as advised in the case of chickens killed in that way, viz., by the cutting of the roof of the mouth, at base of the brain, with a narrow sharp knife, lengthways and across. If the roof of the mouth is pierced at the base of the brain, death is said to be instantaneous and painless.

PLUCKING AND DRESSING.

This should be done as outlined in a previous page in the case of chickens. In plucking, which should begin immediately after dislocation of the neck and be very carefully done, feathers should be left on the neck for three inches.

PACKING.

Instructions as to packing issued by the Commissioner of Agriculture and Dairying, are as follows :—

Every bird should be wrapped neatly in paper, the head with a quantity of thick paper to absorb any blood. The birds should be packed with their backs down and heads to one side.

Twelve to twenty-four birds should be packed in a case. The case should be packed quite full, so as to prevent birds knocking about inside, during transit or in cold storage.

The case recommended is six feet long by twenty inches wide, and from seven to eleven inches deep. Top, bottom and sides are made of half-inch lumber, with a st engthening piece in centre, one-half inch thick.

The cocks and hens should be packed in separate cases.

The weights of the birds and their sex should be marked on the left-hand corner of both ends of the case.

A quantity of clean straw or wood pulp should be put on the bottom of the case and on top of contents, with wrapping paper between the birds and packing material, to prevent any possibility of injury.

SHIPPING BIRDS IN FEATHER.

In shipping birds in feather the following directions should be followed :—

Kill birds by cutting in roof of mouth as described in previous page.

Before being packed the birds should be thoroughly cooled. Pack in air-tight barrels.

In packing, the heads of the birds should be on the middle of their backs. The barrels should be marked so as to describe contents.

DUCKS.

	Lbs.		Lbs.
Pekin Drake	8	Pekin Duck	7
Young Drake	7	Young Duck	6
Aylesbury Drake	9	Aylesbury Duck	8
Young Drake	9	Young Duck	7
Rouen Drake	9	Rouen Duck	8
Young Drake	8	Young Duck	7

Early in the season three to five ducks are allowed to a drake. Later in the season when running outside, eight or twelve. The drake should not be over two years of age.

Ducks lay from 100 to 140 eggs in a season. The eggs take twenty-eight days to hatch. Duck eggs are hatched by hens or ducks. They hatch well by incubator.

RATIONS.

For first three or four days, mash of cornmeal, a little hard boiled egg chopped fine, ground wheat or oats, or granulated oatmeal, the whole being mixed with boiling milk. The young birds are very fond of cabbage, lettuce or clover, which should be chopped fine and may be mixed in mash. Make mash crumbly. Skim-milk for drink.

Later on a mash may be made of cornmeal, bran and oatmeal, with chopped green stuff, and mixed with skim-milk boiled.

Feed the young ducks five times per day. Keep them in dry quarters, out of the hot sun and supply water in limited quantity in shallow dishes, so as to prevent them ducking into it.

After three or four weeks reduce the rations to four per diem. As the ducklings grow the rations may be added to by house-waste, ground bone, beef scraps or cooked meat. Small pieces of charcoal are aids to digestion.

FATTENING.

To fatten, feed on ground grain, meal, beef scraps, &c., made into a mash. Barley meal is excellent in the soft food. Nothing should be fed that will give the flesh a bad flavour.

In nine weeks the ducklings should weigh four and a half pounds each and are ready for market. They should be marketed before the pin feathers begin to grow, which is likely to occur after ninth week.

KILLING AND PICKING.

Ducks are best killed by cutting into base of brain at roof of the mouth. Before killing the feet of the birds should be caught in a loop with head hanging downwards. Immediately after being killed the picking (dry) should be done. Care should be taken to prevent injury of any kind to the carcass.

GEESE.

The best known breeds of geese, and their weights, are as follows :—

	Lbs.		Lbs.
Toulouse Gander	25	Young Gander	20
Toulouse Goose	23	Young Goose	18
Embden Gander	25	Young Gander	20
Embden Goose	25	Young Goose	18

Mating.—One gander to three females. Mate with large vigorous birds.

Management.—In spring make large comfortable nests. In most cases two clutches of eggs are laid, sometimes three. Collect the eggs soon after being laid, as they are easily chilled.

Hatching.—Some breeders who hatch geese on a large scale use incubators. Mrs. Wolcott, Napoleon, Ohio, in *Ducks and Geese*, published by the *Reliable Poultry Journal*, Quincy, Ill., says : 'I incubate their first laying with chicken hens, and frequently let "old mother goose" care for her second hatch. Be sure to have the hens, chosen for sitters, free from lice. Sprinkle the eggs with warm water twice during the last week. Oftener in dry hot weather will do no harm. Remove each gosling from the nest as it hatches, for they are easily mashed. Keep them in a flannel cloth in a basket in a good warm place until all are hatched.'

Sometimes the goslings have to be helped out of the shells.

RATIONS.

For first three days.—Similar food as that recommended for ducklings, or the following, by Mr. C. L. Darlington, Lloyd, N.Y. : cornmeal mixed with hard-boiled eggs, chopped fine, a pinch of black pepper and a handful of sand. After three days discontinue the eggs, and give bread soaked in skim or sweet milk, oatmeal, or broken rice boiled until soft, outer leaves of cabbage, onion tops, and all the grass they can eat. Keep the young birds from water, but give it to them in liberal quantities to drink.' The same authority recommends as a fattening ration a liberal supply of barley meal and cornmeal, soaked in buttermilk. A grass run is indispensable.

KILLING, PLUCKING AND DRESSING.

For local market, the goslings should be ready in twelve to fourteen weeks, and should be of large size at end of 16 weeks.

They should be killed by bleeding in the roof of the mouth, and all feathers taken off except on wing tips. For shipment and local market the geese are not drawn.

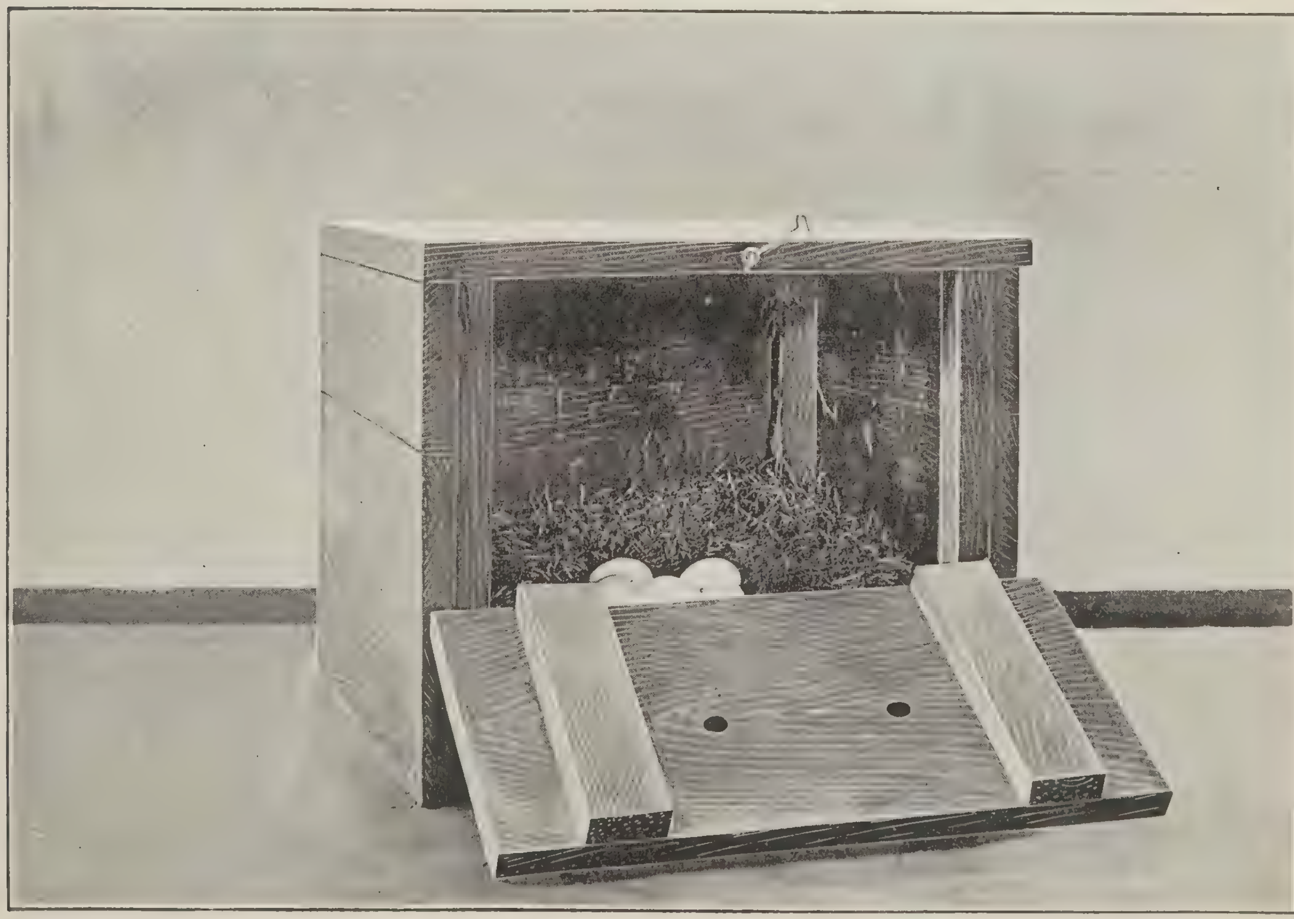
No birds less than nine pounds each should be shipped to the English market. They should be packed ten in a case.

NOTES.

Goose eggs hatch in thirty to thirty-four days.

Some breeders assert that the worth of the feathers from a bird should nearly pay half the cost of its feed for one year.

Hens and chickens in outside coops on grass. Central Experimental Farm, Ottawa.



Nest-box for sitting hens. Central Experimental Farm, Ottawa.

STANDARD BREEDS

AND THEIR CHARACTERISTICS. GOOD WINTER LAYERS AND RAPID FLESH FORMERS.

PLYMOUTH ROCKS.

The different varieties of this breed may all be classed as general purpose fowls. The females are good layers and their progeny make rapid flesh formers. The different varieties are described as follows :—

Barred Plymouth Rocks.

Barred Plymouth Rocks.—Natives of America. Thoroughly acclimatised females make good winter layers as pullets and one year old hens. After that age apt to put on fat, unless skilfully handled. Chickens are hardy and make, when properly fed and cared for, flesh development equal to one pound and one and a quarter pounds per month. Standard weights are as follows :—

	Lbs.
Cock..	9½
Cockerel..	8
Hen..	7½
Pullet..	6½

Pure bred birds should have yellow beaks, shanks and toes. Bright red face, comb, wattles and earlobes. Eyes clear rich bay. The plumage should be bluish gray and distinctly barred, the barring extending on the feathers to near the skin. It is permissible with the females sometimes to have a slight dark stripe down the beak.

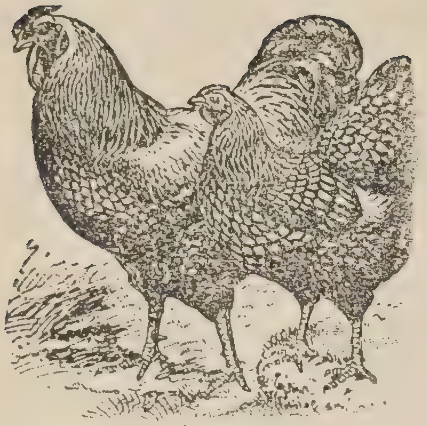
White Plymouth Rocks.—An excellent variety of the same breed. Some strains are more robust than others. Weight and points same as the Barred, except plumage, which should be pure white.

Buff Plymouth Rocks.—A comparatively new variety, but one which has rapidly come to the front on its merits. Weights and points same as others, except plumage, which should be an even shade of golden buff.

Buff Plymouth Rock.

WYANDOTTES.

Of the Wyandotte family there are the sliver-laced, white, golden, buff and black varieties. Not many of the last named are met with. The other varieties are very popular and deservedly so. They are of American origin and acclimatised.



Silver Laced Wyandottes.

Silver Laced Wyandottes.—The first and oldest variety and one possessing much merit as a layer and market fowl, as well as beauty of plumage. The hens make good winter layers, good sitters and good mothers. The chickens are hardy and make quick growth. Of late Silver Laced Wyandottes have not been so numerous as in previous years, perhaps owing to the favour with which the newer and equally good varieties have been received. Standard weight same as white variety. Colour of eggs, light brown.

White Wyandotte.

White Wyandottes.—A typical fowl for the farmer, being blocky, broad in breast, with meaty body and having a low rose comb. Hens are excellent winter layers. Chickens are hardy and make flesh development equal to that of the Barred Plymouth Rock. Great favourites with broiler raisers.

Standard weights are :

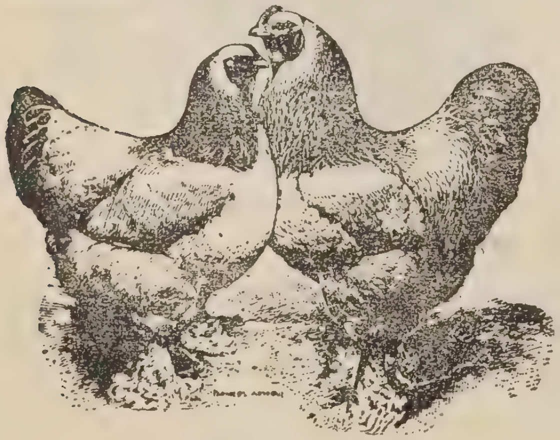
	Lbs.
Cock	$8\frac{1}{2}$
Cockerel	$7\frac{1}{2}$
Hen	$6\frac{1}{2}$
Pullet	$5\frac{1}{2}$

Distinguishing points are : Yellow beak, shanks and toes. Bright red comb, face, wattles and earlobes. Plumage and quills, pure white. Colour of egg, light brown.

Buff Wyandottes.—A new-comer and very popular. Not in such numbers yet as the whites or silver-laced. Their characteristics are very much the same as the other varieties. Standard weights the same.

ASIATICS.

The Asiatic family is composed of Light and Dark Brahmas, Buff, Partridge, White and Black Cochins and Black and White Langshans. They are of ancient origin and great favourites with fanciers and poultry breeders. They are hardy and heavily feathered. As compared with Plymouth Rocks and Wyandottes they are a little slow in putting on flesh, but when full grown make large and heavy birds.



Light Brahmas.

Light Brahmas.—A great favourite and deservedly so. The hens are layers of brown coloured eggs. Chicks are hardy and make steady growth. Hens are too heavy for early sitters, when shells of eggs are apt to be thin. They are the heaviest of the Asiatic breeds.

Standard weights are :

	Lbs.
Cock	12
Cockerel	10
Hen	$9\frac{1}{2}$
Pullet	8

In the thoroughbreds the following points are called for : Bright red face, comb, wattles, and earlobes ; yellow shanks and toes, and beak yellow with dark stripe down the upper mandible.

Dark Brahmas are not so numerous or well-known as the light variety. Their characteristics are much the same. The standard weights are slightly different, viz. :—

	Lbs.		Lbs.
Cocks	11	Hens	8½
Cockerels	9	Pullets	7

Buff, White, Black and Partridge Cochins.—All are well-known, the Buffs being the most numerous and best liked. They are hardy and vigorous. Hens are average layers of dark brown eggs of rich colour. Chicks are hardy and fairly rapid growers. The male of the black variety is 10½ pounds weight, half a pound lighter than the other males of that family. The standard weights are :—

	Lbs.		Lbs.
Cocks	11	Hens	8½
Cockerels	9	Pullets	7

Black Langshans.

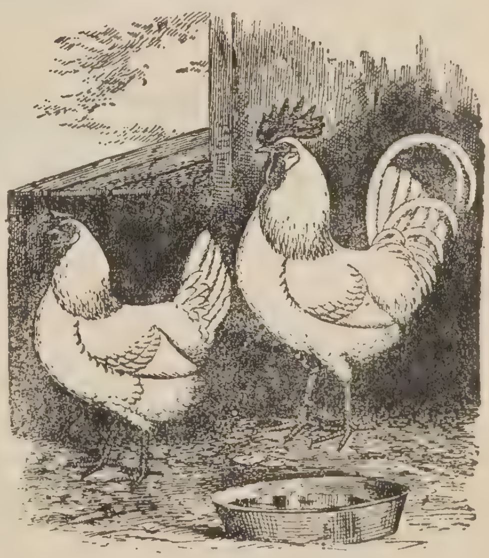
Black and White Langshans.—Of the two varieties the former are much the best known. The Black is an old and well established variety in England, where it has many friends. The females are good layers of an egg of medium size and rich brown colour. The fowls attain large size when properly handled. The chicks are hardy and grow well, but do not make as early market chicks as do the Plymouth Rocks and Wyandottes. Standard weights are :—

	Lbs.
Cocks	10
Cockerels	8
Hens	7
Pullets	6

MEDITERRANEAN CLASS.

The Mediterranean class embraces the Leghorns, Andalusians and Minorcas, all non-sitters. The different points of the several varieties are given below :—

White Leghorns.—One of the best known and most popular breeds. They are veritable egg machines, as indeed are all varieties of the Leghorn family. The females of this variety are hardy and make good winter layers, when fairly well housed. Chickens are hardy and grow rapidly, the young cockerels crowing at eight weeks' of age. There are no standard weights for the varieties of this class. Eggs are white in colour. Some strains lay large white eggs. Of late the size of the White Leghorns has been increased by skilful mating. They are good fowls for farmers, when kept with a breed of sitters.



White Leghorns.

Brown Leghorns.

Brown Leghorns.—Another popular variety with an host of admirers. They possess all the merits of the white variety, but their eggs are slightly smaller. Colour of egg, white. Chickens, hardy and rapid growers.

Buff Leghorns.—A comparatively new, but very popular variety. They have taken a foremost position solely on their merits. The eggs of the hens are large and white in colour. Chickens are quick growers.

Black and Silver Duckwing Leghorns.—The latter is a new comer, and has yet to make friends. Neither are as popular as the other and better known varieties.

Black Minorcas.—A well-known and much appreciated breed. They have taken the place of the Black Spanish, because larger and hardier. The hens lay many large white eggs. Many of their eggs go 6 to one pound, and most of them 7 to a pound. They are good winter layers in a moderately comfortable temperature, such a temperature as all winter layers should be kept in. The chickens are hardy and make vigorous growth. Colour of eggs, white. The standard gives the Minorcas' weight as follows :—

	Lbs.
Cock	8
Cockerel	6½
Hen	6½
Pullet	5½

Black Minorcas.

White Minorcas.—Not nearly in such numbers as the black variety. Characteristics much the same. Eggs large and white. Excellent layers. Weights as given above.

Andalusians.—Sometimes known as blue Spanish. A well-known and popular member of the Spanish family. A prolific layer of large white eggs. They have proved themselves good winter layers, when properly fed and cared for. They are hardy. Chickens are strong and make vigorous growth. The standard weights are :—

	Lbs.		Lbs.
Cock	6½	Hen	5½
Cockerel	5½	Pullet	4½

Cornish Indian Games.

Indian Games.—This breed of Games is divided into 'Cornish' and 'White' varieties : They are popular in England on account of their value as market fowls, and for the same reason are finding favour on this side of the Atlantic. They are extensively used in England, and in many instances in this country for crossing purposes. The hens are fairly good layers of an egg of medium size. Chickens are fairly hardy and make satisfactory development. The standard weights are :—

	Lbs.
Cock......	9
Cockerel..	7½
Hen......	6½
Pullet......	5½

INDEX

SCENES ON CENTRAL EXPERIMENTAL FARM, OTTAWA.

1. Elm leaved Spiraea. 2. Peach leaved Campanula.
3. Office building and Laboratory with surrounding plantation.
4. Part of Lilac group in Arboretum.

APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

DIRECTOR	-	WM. SAUNDERS, LL.D.
AGRICULTURIST	-	J. H. GRISDALE, B. AGR.
HORTICULTURIST	-	W. T. MACOUN
CHEMIST	-	F. T. SHUTT, M.A.
ENTOMOLOGIST AND BOTANIST	-	JAS. FLETCHER, LL.D.
POULTRY MANAGER	-	A. G. GILBERT
SUPT. EXPERIMENTAL FARM, NAPPAN, N.S.	-	R. ROBERTSON
HORTICULTURIST " " "	-	W. S. BLAIR
SUPT. EXPERIMENTAL FARM, BRANDON, MAN.	-	S. A. BEDFORD
" " " INDIAN HEAD, N.W.T.		ANGUS MACKAY
" " " AGASSIZ, B.C.	-	THOS. A. SHARPE

FOR

1901

PRINTED BY ORDER OF PARLIAMENT

OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1902

APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, December 1, 1901.

SIR,—I beg to submit for your approval the fifteenth annual report of the work done, and in progress, at the several experimental farms.

In addition to my report, you will find appended, reports from the following officers of the Central Experimental Farm: From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Chemist, Mr. Frank T. Shutt, and from the Entomologist and Botanist, Dr. James Fletcher. A report is also submitted from the Poultry Manager, Mr. A. G. Gilbert.

From the Branch Experimental Farms there are reports from Mr. R. Robertson, Superintendent, and from Mr. W. S. Blair, Horticulturist of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. S. A. Bedford, Superintendent of the Experimental Farm for Manitoba, at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for the North-west Territories, at Indian Head, and from Mr. Thos. A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific investigations in the chemical laboratory and the information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the Apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms is a gratifying evidence of the desire for information among this class of the community, also of the high esteem in which these records of the work of the farms are held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT

ON THE

EXPERIMENTAL FARMS

REPORT OF THE DIRECTOR, WM. SAUNDERS, LL.D., F.R.S.C., F.L.S.

The year 1901 has, on the whole, been an encouraging one for Canadian farmers. While some crops in Ontario, Quebec and the maritime provinces have fallen below the average yield, others have been unusually good, and the excellent prices received for nearly all farm products during the year have helped to make up for any shortage in particular crops. In Ontario, fall wheat, oats and pease have given yields unusually light, while hay, which occupies a nearly equal area, has given a remarkably heavy return, and the product has been of good quality. Hay has also given exceptionally large crops in Quebec and the maritime provinces, in which sections, however, oats have fallen below the average. Spring wheat and barley are said to have produced nearly average returns in the eastern provinces, while Indian corn and field roots have gone above the average.

In the western provinces of Manitoba and British Columbia, agricultural crops of all sorts have been very good, while in many parts of the North-west Territories the yields have been extraordinary and probably unprecedented.

The experimental farms have had results corresponding much with those of the best farmers in their neighbourhood, and on the whole, as will be seen by consulting the following pages, the returns have been very encouraging. The Fifteenth Annual Report of the work of these institutions is herewith presented. The reports previously issued, one of which has appeared annually for the last fourteen years,—covering practical experimental work to determine many points along all the different lines embraced in Canadian agriculture, horticulture, forestry and ornamental planting—have had a wide influence in moulding the thought and practice of a large number of the more intelligent people engaged in these various branches of work, and through them, have wielded an influence on others. Object lessons, framed after the best methods, and covering a very large field, have been provided every year at each of the experimental farms, and visiting farmers who have come to learn, as many of them annually do, have carried home with them useful ideas, which, put in practice on their own farms, have added to the profits of their business.

Those who are so situated that they cannot visit the farms, can receive free, by asking for them, the annual reports and the bulletins prepared by the officers of the farms, replete with information covering, as fully as is practicable, many of the different lines of work undertaken, and the results can be studied at leisure. Thus, the information acquired is spread over the whole Dominion. Nearly fifty thousand farmers now receive the publications of the experimental farms, and their number is steadily increasing.

The experimental farms were among the first agencies provided for the special purpose of aiding Canadian farmers in the solution of the many difficulties which surround their calling in the various climates of the Dominion, and the progress which has been made in all branches of this national industry owes, no doubt, much to the more general adoption of the sound principles governing good farming, which have been persistently advocated on every occasion by the officers of these institutions. The many problems associated with the thorough preparation of the soil, and the best methods to adopt to maintain its fertility, have been carefully investigated and reported on. The great importance of selecting the most productive sorts of seed has been repeatedly urged and tangible proofs offered of the success attending such practice. To encourage and assist farmers in their endeavours along this line, varieties of wheat, oats, barley, and pease of established value have been grown in considerable quantities on the experimental farms for the past 12 or 13 years, and distributed in sample bags, free, by mail, to all farmers who apply for them. The demand for these samples has been so great that it has been found necessary to limit the number sent, to one only to each applicant. For the past six years more than thirty thousand farmers have participated annually in these co-operative experiments, which have involved the free distribution, through the mail, of over sixty tons of seed each season. The liberal provision thus made for Canadian farmers by the Dominion government has been of very great benefit, and there are now, as a result of this work, many of these high class productive sorts of grain under cultivation in almost every settled locality throughout the Dominion. In addition to the actual gain resulting from the general introduction of more profitable sorts of grain, this work has had a wide educational influence. Farmers have learned to observe the characteristic variations in varieties and their powers of observation and comparison, thus awakened, have been brought to bear on other problems in their calling, to their individual advantage and profit. The cultivation of these good sorts by the more enterprising farmers has interested their neighbours, who have benefited in turn, and hence the good influences attending this useful work are extending through all sections of the farming community.

Some other branches of special work which have been under my personal charge have also made considerable progress. The experiments conducted in the cross-breeding of commercial apples and hardy Siberian crabs, with the object of producing very hardy apple trees, such as are likely to be adapted to the climates of our north-west country (where ordinary sorts do not grow), have been successfully continued. Several new varieties have fruited during the past year, which promise to be of value. Some very interesting new crosses in wheat have also been produced. A large number of samples of grain has been tested for vitality, received from farmers in different parts of the country. Some particulars relating to these tests, and the number of them, will be found at a subsequent page in the report from Mr. W. T. Ellis, who has charge of this branch of the work.

Many desirable additions have been made to the collection of ornamental trees and shrubs on the grounds surrounding the buildings on the Central Experimental Farm, which have thus been made additionally attractive and instructive to visitors.

The accompanying report will be found to contain a large amount of practical information, such as is likely to be helpful to all those who are engaged in Canada's great national industry, agriculture.

EXPERIMENTAL WORK

CONDUCTED AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, ONTARIO.

EXPERIMENTS WITH OATS.

One hundred and seven varieties of oats have been under trial in the test plots at the Central Experimental Farm during 1901. The object of these experiments has been to gain information as to the relative productiveness, earliness and other characteristics of the different sorts. The soil on which these oats were sown was a heavy sandy loam of good quality, more or less mixed with clay. The previous crop was field roots. The land received a dressing in the winter of 1899-1900 of about twelve tons of fresh barn-yard manure per acre, which was placed on the frozen ground in small heaps of about one-third of a cart load each, and spread and ploughed under in the spring. No manure has been applied since. In the autumn of 1900, after the roots were gathered, the land was ploughed about seven inches deep and left in that condition until the following spring when it was cultivated twice with a two-horse cultivator and harrowed twice with the smoothing harrow before the oats were sown.

The seed of most of the varieties was sown on April 17, the remainder from April 26 to 29 all on plots of one-fortieth of an acre each, seed being used in each case at the rate of two bushels per acre.

Among the new sorts brought under trial are Irish Victor, Beseler and Atlantic, all white branching oats. Pioneer, a black branching oat, and Goldfinder, a large yellow half-sided oat, both new introductions of the Garton Bros., of Newton-le-Willows, England. To Prof. C. Doxrud, of the Technical School, Christiania, Norway, I am indebted for two varieties of oats from that country. Black No. 6 and Summer No. 5, and from the United States Department of Agriculture I have also received two new sorts, Tobolsk 2800, and Zhelanni 2963.

Included in the list there are also thirteen cross-bred sorts, all of which have been originated on the experimental farms:—Brandon, Cromwell, Holland, Kendal, King, Master, Medal, Milford, Miller, Olive, Oxford, Pense and Russell.

There are also two new cross-bred sorts in the list this year. These are further results of the work in cross-breeding done by Dr. A. P. Saunders, at Brandon, in 1892. The following are their names and parentage:—

Dixon.—Black Tartarian female, with Early Gothland male.

Forbes.—Giant Cluster female, with Prize Cluster male.

It will be seen from the following results that oats have fallen below the average in yield this year.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
1	Liberty	Aug. 8	102	51—53	Stiff	8½— 9½	Branching	64	24	33	Considerably.
2	Virginia White Abundance........	July 28	94	50—52	"	9 —10	" .	60	—	37½	Slightly.
3	Cromwell	" 25	100	49—51	"	10 —11	Half sided	58	8	36½	Considerably.
4	Uberfluss......	" 28	103	50—52	"	9 —10	Branching	57	2	31	Slightly.
5	Joanette............	" 28	103	35—37	"	8 — 9	" .	57	2	36¼	"
6	Columbus..........	" 26	101	39—41	"	8 — 9	" .	57	2	35	"
7	Milford, Black....	" 31	96	49—51	"	10 —11	Half sided	57	2	33	Badly.
8	Doncaster Prize	" 29	94	51—53	Weak	9 —10	Branching	57	2	31	"
9	Kendal, White.....	Aug. 4	100	49—51	Stiff	8½— 9½	Half sided	55	30	33	Considerably.
10	Early Maine........	July 25	100	40—42	"	11 —12	Branching	55	10	33½	Slightly.
11	American Triumph..	" 25	100	39—41	"	8 — 9	" .	54	24	33	Considerably.
12	Lincoln	" 25	100	38—40	"	8¾— 9½	" .	54	24	35	"
13	Improved American.	" 25	100	40—42	"	8 — 9	" .	54	24	33	"
14	Olive, Black........	" 31	96	51—53	Medium..	9 —10	Half sided	54	24	33	Badly.
15	Mennonite..........	" 23	98	37—39	Stiff	7 — 8	Branching	54	24	31	Considerably.
16	Eureka.	" 31	96	54—56	Medium..	9 —10	" .	53	18	30	"
17	Black Beauty.	" 20	95	41—43	Stiff.. ...	10 —11	" .	53	18	32½	Slightly.
18	Rennie's Prize White	Aug. 2	96	55—57	Weak	9 —10	" .	52	32	34	Badly.
19	Milford, White.....	July 31	96	50—52	Stiff	10 —11	Half sided	52	12	34	"
20	Oxford..	" 25	100	45—47	"	9 —10	" .	51	26	37½	Considerably.
21	Abundance.........	" 25	100	41—43	"	9½—10	Branching	51	6	33½	Slightly.
22	Olive, White.......	" 31	96	53—55	"	8 — 9	Half sided	50	—	33½	Considerably.
23	Pense, Black..	" 31	96	52—54	"	9 —10½	" .	50	—	32	Badly.
24	California Prolific B.	" 28	103	40—42	"	7½— 8½	Sided.....	50	—	32	Slightly.
25	Prolific Blk. Tartar'n	" 28	103	40—42	"	8 — 9	"	48	28	34	"
26	Leutewitzer	" 29	94	50—52	Weak	9 —10½	Branching	48	28	30	Considerably.
27	Banner.............	" 25	100	41—43	Stiff	9½—10½	" .	48	28	33	Slightly.
28	Anderbecker........	Aug. 2	98	55—57	Medium..	9 —10	" .	48	28	31½	Considerably.
29	King..........	July 25	100	39—41	Stiff	9½—10½	" .	48	28	36½	Slightly.
30	Holstein Prolific...	" 25	100	41—43	"	9 —10	" .	48	28	36	"
31	American Beauty....	" 23	98	39—41	"	8 — 9½	" .	48	8	37	"
32	Irish Victor.........	" 25	100	39—41	"	8 — 9	" .	48	8	35	"
33	Aitken, Black.......	" 28	103	44—46	.....	10½—11	" .	48	8	34½	"
34	Selchower	" 29	94	58—60	Weak	10 —11	Sided.....	48	8	33	Badly.
35	Pense, White.......	" 31	96	57—59	Stiff	9 —10½	Half sided	47	22	34	"
36	Sensation	" 25	100	44—46	"	8 — 9	Branching	47	22	37½	Considerably.
37	Cream Egyptian....	" 25	100	39—40	"	8 — 9½	Half sided	47	22	37	"
38	Thousand Dollar....	" 23	98	42—44	"	8½— 9½	Branching	47	22	35	Slightly.
39	Russell.............	" 25	100	41—43	"	9 —10	" .	47	22	34½	"
40	Poland......... ..	" 29	94	58—60	Weak	9 —10½	" .	47	22	36	Badly.
41	Rosedale	" 28	103	43—45	Medium..	8 — 9	Half sided	47	2	37½	Considerably.
42	Salzer's Big Four....	" 23	98	39—41	" ..	10 —11	Branching	47	2	32½	"
43	Hazlett's Seizure....	" 25	100	41—43	Stiff	8 — 9½	" .	46	16	34	Slightly.
44	Master.............	" 28	103	46—48	"	9½—10	Half sided	46	16	35½	"
45	White Schonen	" 25	100	41—43	"	8 — 9	Branching	46	16	34½	"
46	Bestehorn's Abun'nce	Aug. 8	102	40—42	"	7 — 8½	" .	45	30	34¾	"
47	Buckbee's Illinois...	July 25	100	44—46	"	8 — 9	" .	45	10	38½	Considerably.
48	Golden Beauty	" 25	100	42—44	Medium..	8 — 9½	" .	45	10	33½	Slightly.
49	Blk. Tartarian Imp.	" 28	103	40—42	Stiff	8½— 9	Sided.....	45	10	35	"
50	Tobolsk No. 2800....	" 29	104	42—44	"	9 —10	Branching	44	4	36¾	Considerably.
51	Oderbruch.... ...	" 28	103	44—46	"	9 —10½	Half sided	44	4	35½	"
52	Danish Island	July 26	101	40—42	Stiff	9 —10½	Branching	44	4	31½	Considerably.
53	White Giant........	" 26	101	43—45	"	9 —10	" ..	44	4	31	Slightly.
54	Newmarket	" 25	100	41—43	"	8½— 9½	" ..	44	4	37	"
55	Improved Ligowo...	" 23	98	39—41	Medium..	8 — 9½	" ..	44	4	37	Badly.
56	Early Dawson......	" 26	91	50—52	Weak	10 —11	" ..	44	4	32½	Considerably.
57	Early Gothland.....	" 26	101	43—45	Stiff	9 —10	Half Sided	44	4	37½	Slightly.
58	Victoria Prize.... ..	" 25	90	46—48	Weak	10½—11½	Branching	43	18	36	Considerably.
59	New Zealand........	Aug. 7	113	44—46	Stiff	9 —10½	Sided... .	42	12	34½	"
60	Dixon...............	" 8	102	41—43	"	9 —10	"	42	12	35½	Slightly.
61	Wide Awake........	July 25	100	38—40	"	8 — 9½	Branching	41	26	34½	"
62	Holland............	" 28	103	38—40	"	9 —10½	Sided.....	41	26	33	"

OATS—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.		Number of days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
					Inches.		Inches.		Bush.	Lbs.	Lbs.	
63	Pioneer	July	25	100	34—36	Stiff	9 —10	Branching	41	26	35	Considerably.
64	Early Blossom	"	28	103	41—43	"	8 — 9½	Half Sided	41	26	30½	"
65	Beseler	Aug.	10	104	45—47	"	9½—10½	Branching	41	26	35½	Badly.
66	Black No. 6 Summer	"	8	105	47—49	"	9 —10½	Sided	41	6	32	"
67	Scottish Chief	"	2	96	43—45	"	11 —12	Branching	41	6	38	Slight'y.
68	Bavarian	July	25	100	42—44	"	10 —11	"	40	20	34	"
69	Abyssinia	"	28	103	39—41	"	9 —10	Half Sided	40	20	34	Considerably.
70	Wallis	"	23	98	37—39	"	8 — 9½	Branching	40	20	37¾	Slightly.
71	Winter Grey	"	26	91	53—55	Weak	10 —11	"	40	20	31½	Badly.
72	Salines	"	29	104	42—44	Stiff	10 —11½	"	40	20	33	Considerably.
73	Australian	Aug.	2	108	43—45	"	9 —10	Sided	40	20	31	"
74	Flying Scotchman	July	22	97	45—47	"	9½—10½	Branching	40	..	33	"
75	Goldfinder	"	28	103	42—44	"	9 —10	Half Sided	39	14	31	Slightly.
76	Mortgage Lifter	"	28	93	50—52	Weak	9 —10½	Branching	39	14	36½	"
77	Miller	"	31	106	42—44	Stiff	8 — 9	"	39	14	34½	"
78	Sargentfree	Aug.	2	96	42—44	"	8 — 9½	"	38	28	37½	"
79	Probstey	"	8	102	42—44	"	7 — 8½	"	38	28	35	Considerably.
80	Imported Irish	July	25	100	40—42	"	9 —10	"	38	8	37½	Slightly.
81	Black Mesdag	"	20	95	41—43	"	10 —12	"	37	22	31½	"
82	Forbes	Aug.	8	102	40—42	"	8 — 9	Sided	37	22	30·	Considerably.
83	Atlantic	"	7	101	43—45	"	8½— 9½	Branching	37	22	36¾	Badly.
84	Brandon	July	28	103	45—47	"	10 —11	Half Sided	37	2	32½	Slightly.
85	White Russian	"	25	100	41—43	"	8 — 9	Branching	37	2	35	Considerably.
86	Russell Half Sided	Aug.	2	96	42—44	"	10 —11	Half Sided	36	16	36	Slightly.
87	Kendal Black	"	6	102	51—53	"	8½— 9½	"	36	16	34	Badly.
88	White Wonder	July	23	88	40—42	"	9 —10	Branching	35	30	36½	Slightly.
89	Bayonet	"	26	91	43—45	"	10 —11	"	35	30	36½	"
90	Great Northern	"	31	96	39—41	"	8 — 9	"	35	30	32	Considerably.
91	Siberian	"	28	103	43—45	"	8 — 9	"	34	24	34	Slightly.
92	Bonanza	"	22	97	44—46	Medium	10 —11½	"	33	18	36½	Badly.
93	Coulommiers	Aug.	2	108	43—45	Stiff	10 —11	"	33	18	35½	Considerably.
94	Welcome	July	23	88	39—41	Medium	9 —10½	"	32	32	36½	Slightly.
95	Swedish Select No. 2788	"	29	104	38—40	Stiff	7 — 8½	"	32	32	35½	Considerably.
96	Russell Branching	Aug.	8	102	36—38	Medium	8 — 9	"	32	32	37½	Slightly.
97	Golden Giant	July	28	103	40—42	"	9 —10	Sided	32	12	31	"
98	Early Archangel	"	23	98	37—39	"	9 —10½	Branching	32	12	37	Badly.
99	Early Golden Prolific	"	25	100	36—38	Stiff	8 — 9	"	32	12	31	Slightly.
100	Golden Tartarian	"	31	106	38—40	"	9 —10	Sided	31	6	30	Considerably.
101	Tartar King	"	23	98	39—41	"	9 —10½	"	31	6	32	Badly.
102	Duppaner Summer, No. 5	Aug.	6	103	46—48	"	9 —10	Branching	81	6	33	Considerably.
103	Waverley	July	25	100	40—42	"	7 — 8	"	30	..	34½	Slightly.
104	Longhoughton	"	28	103	30—32	Medium	9 —10	"	20	20	33½	"
105	Scotch Potato Imp., 1901	"	28	103	32—34	"	8 — 9½	"	20	20	35½	Badly.
106	Medal	Aug	7	103	44—46	"	10 —11	Half Sided	19	14	32	"
107	Zhelanni, No. 2963	July	29	104	46—48	Weak	11 —12½	Branching	18	28	33½	Slightly.

SELECT LIST OF OATS.

Seven years ago a system of uniform trial plots was planned to be conducted at all the experimental farms, which provided for the growing of the promising sorts of the most important agricultural crops side by side, on similar soil and all of the same class being sown on the same day so that the conditions might be uniform. The results have been published each year since in an annual crop bulletin which has been issued as early in the season as practicable. After three years of trial the average yields for that period obtained at all the experimental farms was published in the bulletin for

1897 (No. 29). Similar results with added experience have been published in the annual crop bulletin each year since, the results for the seventh year, 1901, having recently appeared in bulletin No. 39. In these bulletins the six or twelve sorts found most productive on each farm have been specially noted. All those varieties which during five years' trial do not find their way at any time into these lists of the best sorts at any of the experimental farms are dropped from the list at the end of that period to make room for other new and promising kinds. Occasionally where a variety of grain shows some radical defect, such as persistent weakness of straw, it is discarded after a shorter trial. By this method the lists are kept within reasonable limits.

The following sorts of oats have been thus dropped during the past two or three years:—Coulommier's, Doncaster Prize, Early Dawson, Early Etampes, Imported Irish, Medal, Mortgage Lifter, Poland, Prize Cluster, Rennie's Prize, Scotch Hopetoun, Welcome, White Monarch, White Wonder, Winter Grey. Some of the varieties so discarded from the uniform trial plots are still continued in the general list grown at some of the experimental farms in the discretion of the superintendent.

In the following list of oats the average yield per acre at all the experimental farms is given of all the varieties which have been under trial for three years or over. The periods reported on range from three to seven years.

SELECT LIST OF VARIETIES OF OATS.

Number.	Names of Varieties.	Kind of Head.	Colour of Grain.	Number of Years under test.	Average yield per acre at all the Experimental Farms.	
					Bush.	Lbs.
1	Banner	Branching	White	7	76	14
2	American Beauty	"	Yellow	7	75	33
3	Mennonite	"	"	6	75	23
4	Danish Island	"	White	4	75	21
5	New Zealand	Sided	"	3	75	19
6	Black Beauty	Branching	Black	5	74	3
7	Improved American	"	White	5	73	29
8	White Giant	"	"	4	73	5
9	Thousand Dollar	"	"	4	73	1
10	Holstein Prolific	"	"	7	72	31
11	Bavarian	"	"	7	72	21
12	Buckbee's Illinois	"	"	6	72	4
13	Golden Beauty	"	Yellow	7	71	32
14	Salines	"	"	3	71	27
15	Columbus	"	"	7	71	17
16	Golden Giant	Sided	"	7	71	8
17	Early Golden Prolific	Branching	White	7	71	—
18	Abundance	"	"	7	70	20
19	American Triumph	"	"	7	70	20
20	Kendal	Half sided	Black	3	70	18
21	Lincoln	Branching	White	7	70	16
22	Golden Tartarian	Sided	Yellow	5	70	8
23	White Schonen	Branching	White	7	69	31
24	Oderbruch	Half sided	"	7	69	25
25	Siberian	Branching	"	5	69	22
26	Wallis	"	"	7	69	14
27	Holland	Sided	Yellow	4	69	1
28	Wide Awake	Branching	White	7	68	32
29	Early Blossom	Half sided	"	7	68	13
30	Early Gothland	"	"	7	68	1
31	Improved Ligowo	Branching	"	7	67	18
32	Olive	Half sided	Black	6	67	15
33	Early Maine	Branching	White	7	67	6
34	Califormia Prolific Black	Sided	Black	7	67	3
35	White Russian	Branching	White	7	67	2
36	Hazlett's Seizure	"	"	7	66	20
37	Early Archangel	"	"	7	66	16

SELECT LIST OF OATS—*Concluded.*

Number.	Names of Varieties.	Kind of Head.	Colour of Grain.	Number of Years under test.	Average yield per acre at all the Experimental Farms. Bush.	Lbs.
38	Milford	Half sided	Black	3	65	23
39	Joanette	Branching	"	7	65	18
40	Newmarket	"	White	5	65	16
41	Cromwell	Half sided	Yellow	6	65	5
42	Abyssinia	"	White	7	65	3
43	Miller	Branching	"	6	64	25
44	Rosedale	Half sided	"	7	64	21
45	Pense	"	Black	6	64	15
46	Prolific Black Tartarian	Sided	"	7	64	10
47	King	Branching	White	5	64	2
48	Russell	Half branching	Yellow	6	63	29
49	Flying Scotchman	Branching	White	7	63	16
50	Master	Half sided	Yellow	6	62	21
51	Oxford	"	White	6	62	10
52	Cream Egyptian	"	"	7	61	33
53	Bonanza	Branching	"	7	61	26
54	Brandon	Half sided	Yellow	6	61	25
55	Black Mesdag	Branching	Black	4	60	22

EXPERIMENTS WITH BARLEY.

Sixty-seven different sorts of barley have been under test at the Central Experimental Farm during 1901. Thirty of these have been two-rowed sorts, and thirty-seven six-rowed. The land on which the barley was sown, adjoined that used for oats, and was of the same character and quality and had similar manuring and preparation. The size of the plots was one-fortieth of an acre each. The two-rowed sorts were sown at the rate of two bushels per acre, and the six-rowed at the rate of one and three-quarter bushels per acre. The seed of nearly all these varieties of barley, both two-rowed and six-rowed was obtained from selected heads picked by hand, the largest and plumpest being chosen.

Among the two-rowed sorts there are six new varieties this year. Oregon received from the United States, Bestehorn's Kaiser and Fitchel Mountain from Germany, Plumage from Norway and Standwell and Invincible, two varieties recently introduced by the Garton Bros., Newton-le-Willows, England. In this group are also included the following seventeen hybrid sorts, all of which have been produced at the experimental farms. Beaver, Bolton, Clifford, Dunham, Fulton, Gordon, Harvey, Jarvis, Leslie, Logan, Monck, Nepean, Pacer, Pelham, Rigid, Sidney and Victor.

TWO-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs.	
1	French Chevalier..........	July	25	90	41—43	Medium....	3½—4	55	10	51½	No rust.
2	Danish Chevalier..........	"	28	93	34—36	"	3½—4	47	4	52	"
3	Beaver.................	"	20	85	40—42	Stiff........	3¼—3¾	46	2	50½	"
4	Canadian Thorpe	"	23	88	35—37	"	2½—3	45	10	50½	"
5	Standwell	"	23	88	35—37	Medium....	2½—3	42	34	51¼	"
6	Clifford................	"	23	88	45—47	Stiff........	3½—4	41	42	51½	"
7	Nepean.................	"	23	88	49—51	Medium. ...	3½—3¾	41	2	51	"
8	Logan..................	"	23	88	43—45	"	4 —4½	39	18	50½	Slightly.
9	Kinver Chevalier	"	25	90	33—35	"	3½—4	36	22	50½	No rust.
10	Plumage from Norway....	"	28	93	36—38	Stiff........	3 —3½	34	28	51½	"
11	Gordon.................	"	20	85	42—44	"	2 —2½	33	46	50½	"
12	Jarvis..................	"	18	83	40—42	"	3 —3½	31	42	49	"
13	Sidney	"	22	87	47—49	Medium. ...	4 —4½	31	22	51	"
14	Prize Prolific	"	28	93	31—33	Stiff........	4 —4½	31	12	51¼	"
15	Dunham................	"	20	85	42—44	"	3 —3½	30	30	48¼	"
16	Invincible..............	"	28	93	30—32	"	2¾—3¼	29	28	52	"
17	Pacer	"	24	89	35—37	"	3½—4	26	42	49½	Slightly.
18	Pelham.................	Aug.	2	95	36—38	"	3½—4	26	12	51¼	"
19	Bolton..................	July	22	94	38—40	"	3 —3½	25	10	51	No rust.
20	Fichtel Mountain.........	Aug.	2	95	32—34	"	3½—4	22	4	50¾	Slightly.
21	Victor..................	July	23	88	36—39	"	3½—4	21	42	52	No rust.
22	Improved Thanet..........	Aug.	6	99	35—37	Medium....	4 —4½	21	12	46	Considerably.
23	Bestehorn's Kaiser........	"	8	101	36—38	Stiff........	3 —3½	20	20	48¼	"
24	Fulton	July	25	90	38—40	"	2½—3	20	10	49	Slightly.
25	Oregon.................	Aug.	8	101	31—33	Weak	4 —4½	18	36	46	"
26	Duck-bill................	"	8	96	25—27	Medium....	2½—3	16	12	....	Considerably.
27	Harvey..................	July	25	97	35—37	Stiff........	3 —3½	14	38	49½	No rust.
28	Monck..................	Aug.	6	99	40—42	"	3½—4	14	28	50½	Badly.
29	Rigid..................	"	8	101	32—34	"	3 —3½	14	28	49	Slightly.
30	Leslie..................	July	25	97	34—36	"	3½—4	11	2	50½	No rust.

SELECT LIST OF VARIETIES OF TWO-ROWED BARLEY.

In this list is given the average yield per acre obtained during the past three to seven years from the most productive varieties grown at all the experimental farms, with the length of time they have been under test. Only those are included which have been three years or longer under trial. Further particulars as to how these select lists have been worked up will be found under 'Select list of oats.'

Number.	Names of Varieties.	Number of Years under trial	Average yield per acre at all the Experimental Farms.		Number.	Names of Varieties.	Number of Years under trial	Average yield per acre at all the Experimental Farms.	
			Bush.	Lbs.				Bush.	Lbs.
1	French Chevalier...	7	46	6	10	Nepean............	6	42	7
2	Jarvis.............	3	45	7	11	Newton	7	42	3
3	Clifford...........	3	44	44	12	Fulton	3	41	21
4	Harvey	3	44	21	13	Leslie	4	41	20
5	Dunham	5	44	16	14	Bolton	7	41	19
6	Beaver............	7	43	39	15	Sidney............	7	41	16
7	Danish Chevalier....	7	43	31	16	Prize Prolific.	7	40	12
8	Canadian Thorpe....	7	43	26	17	Kinver Chevalier....	7	39	7
9	Logan	4	42	38	18	Victor	6	38	41

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
					Inches.		Inches.	Bush.	Lbs.	Lbs	
1	Odessa............	April 19	July 18.	90	40—42	Stiff	3 —3½	41	2	50½	No rust.
2	Mensury........	May 15	Aug. 6.	83	39—41	"	3 —3½	39	8	47¾	Badly.
3	Stella..........	April 19	July 18.	90	36—38	"	3¼—3¾	36	42	52	No rust.
4	Claude............	" 19	" 18.	90	38—40	"	2½—3	36	42	49½	"
5	Munro...........	May 3	" 22.	80	38—40	"	3 —3½	35	10	50	"
6	No. 8 from Norway	April 26	" 17.	82	42—44	Medium..	2½—3	34	18	50½	"
7	Royal............	" 19	" 18.	90	36—38	Stiff......	3 —3½	33	26	50¾	"
8	Nugent.....	" 19	" 18.	90	38—40	Medium..	3 —3½	33	6	50½	"
9	Blue Long Head..	" 26	" 24.	89	36—38	Stiff......	2½—3	31	42	44½	"
10	Princess Sialof....	May 3	Aug. 6.	95	34—36	Medium..	3½—4	29	28	48½	Slightly.
11	Rennie's Improved	April 19	July 18.	90	38—40	Stiff.....	2 —2½	29	18	51	No rust.
12	Parkin...........	May 3	" 22.	80	37—39	"	2½—3	29	18	47	"
13	Petschora....	April 19	" 17.	89	38—40	Medium..	3 —3½	27	34	48	"
14	Pioneer..........	" 19	" 22.	94	38—40	Stiff......	3 —3½	27	34	50	"
15	Vanguard	" 19	" 18.	90	38—40	"	3½—4	27	34	52	"
16	Beardless from Salzer............	May 3	" 22.	80	38—40	"	2½—3	27	34	47	"
17	Albert...........	April 19	" 17.	89	36—38	Medium..	2½—3	26	42	51½	"
18	Garfield	" 19	" 20.	92	38—40	Stiff......	2½—3	26	22	49½	"
19	Yale....	" 19	" 22.	94	38—40	"	3 —3½	26	2	49½	"
20	Oderbruch..... ..	" 19	" 20.	92	38—40	"	3 —3½	26	2	51	"
21	Lytton.	" 19	" 23.	95	35—37	"	3¼—3¾	26	2	50	Slightly.
22	Common.........	" 19	" 17.	89	36—38	Medium..	2½—3	26	2	50½	No rust.
23	Trooper..........	" 19	" 19.	91	38—40	Stiff......	2½—3	25	10	51	"
24	Summit.........	" 19	" 18.	90	36—38	"	2½—3	25	10	51¾	"
25	Phoenix..........	" 19	" 18.	90	38—40	"	2½—3¼	25	10	50½	"
26	Chinese Hulless...	May 3	" 27.	85	23—25	"	2½—3	24	28	60½	"
27	Salzer's Silver King	" 3	" 27.	85	29—31	"	2¾—3¼	24	28	47	"
28	Baxter............	April 19	" 17.	89	36—38	Medium..	2 —2½	24	18	51½	"
29	Hordeum Chousk (Hulless)........	May 3	" 22.	80	22—24	" ..	3 —3½	23	26	57½	"
30	Empire.....	April 19	" 18.	90	39—41	Stiff......	2½—3	22	34	52	"
31	Argyle............	" 19	" 18.	90	37—39	"	2½—3	21	42	50	"
32	Brome...........	" 19	" 19.	91	36—38	Medium..	2½—3	21	42	52½	"
33	Excelsior...	" 19	" 19.	91	36—38	Stiff......	3 —3½	17	34	48½	"
34	Success.........	May 17	Aug. 2.	77	29—31	"	2½—3	16	12	47	"
35	Sisolsk Spring No. 2962........	April 17	July 22.	96	37—39	"	3½—4	16	2	47½	"
36	Blue Short Head..	May 3	Aug. 14.	103	19—21	"	2 —2¼	11	12	41½	Badly.
37	Hulless Black.....	April 19	July 19.	91	27—29	Medium..	2 —2½	9	38	62½	No rust.
38	Hulless White	" 19	" 22.	94	30—32	" ..	2 —2½	6	2	60½	"

Among the six-rowed barleys there are five new sorts this year. Princess Sialof from Germany. No. 8 from Norway, and Chinese Hulless, Hordeum Chousk and Sisolsk Spring, No. 2962, from the United States Department of Agriculture, Washington.

There are also included in the above list the following nineteen hybrid sorts, all of which have been produced at the experimental farms:—Albert, Argyle, Brome, Claude, Empire, Garfield, Lytton, Munro, Nugent, Parkin, Phœnix, Pioneer, Royal, Stella, Success, Summit, Trooper, Vanguard and Yale.

SELECT LIST OF VARIETIES OF SIX-ROWED BARLEY.

In this list is given the average yield per acre obtained during the past three to seven years from the most productive sorts grown at all the experimental farms, with the length of time they have been under test. Only those are included which have been three years or longer under trial. Particulars as to how these select lists have been made up will be found under 'Select list of oats.'

Number.	Names of Varieties.	Number of Years under trial.	Average yield per acre at all the Experimental Farms.	
			Bush.	Lbs.
1	Mensury	7	51	29
2	Claude	3	50	44
3	Mansfield	4	48	44
4	Odessa	7	48	19
5	Argyle	4	48	11
6	Yale	3	47	35
7	Trooper	7	47	4
8	Common	7	46	38
9	Royal	7	46	32
10	Oderbruch	7	45	35
11	Albert	3	45	28
12	Garfield	3	45	20
13	Baxter	7	45	3
14	Nugent	7	44	32
15	Petschora	7	44	3
16	Rennie's Improved	7	44	3
17	Summit	7	43	44
18	Stella	7	43	43
19	Brome	3	43	40
20	Empire	4	43	12
21	Pioneer	7	42	45
22	Blue Long Head	5	42	38
23	Phœnix	7	42	22
24	Vanguard	7	42	20
25	Excelsior	6	42	15
26	Empire	7	42	5
27	Champion	6	42	4
28	Hulless Black	3	40	45
29	Success	7	38	42
30	Hulless White	3	37	30

EXPERIMENTS WITH FALL WHEAT.

Twenty varieties of fall wheat were under test during the past season. All but two were sown on September 7 on a piece of light, sandy loam, of good quality, on plots of one-fortieth of an acre each. The previous crop was rape, which was fed off early so as to permit of the land being worked well before sowing. It was ploughed from 6 to 7 inches deep, and well harrowed to bring it into a good condition of tilth. It was manured in the spring of 1900, before sowing the rape with about 20 tons of barn-yard manure per acre. The sowing of two of the varieties, Dawson's Golden Chaff and Surprise, was repeated on October 1, but it will be seen that the earlier sowings have produced the largest crops. All the varieties came through the winter well, and made a very strong and even growth and gave good returns. This grain was sown at the rate of $1\frac{3}{4}$ bushels of seed per acre.

FALL WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
1	Gold Coin............	July 13	309	50—52	Medium..	2½—3	Beardless.	52	15	62	Slightly.
2	Dawson's Golden Chaff	" 13	309	53—55	Stiff	3 —3½	" .	49	30	62	"
3	Early Red Clawson ..	" 13	309	56—58	"	3 —3½	" .	49	2	60½	"
4	Reliable.............	" 13	309	54—56	Medium..	3 —3½	Bearded..	47	12	63½	"
5	Jones' Winter Fife...	" 15	311	54—56	Stiff	4 —4½	Beardless.	45	50	62½	No rust.
6	Buda Pesth..........	" 13	309	46—48	"	2½—3	Bearded..	44	—	62½	"
7	Imperial Amber	" 17	313	52—54	Medium..	3½—4	" ..	44	—	61½	"
8	Golden Cross........	" 15	311	50—52	" ..	2½—3	" ..	43	5	62¼	Slightly.
9	Surprise.......... ..	" 13	309	48—50	Very stiff.	3 —3½	Beardless.	42	10	61½	No rust.
10	Red Velvet Chaff....	" 15	311	52—54	Stiff ...	3 —3½	" .	40	20	62½	Slightly.
11	Egyptian Amber.....	" 17	313	48—50	"	3 —3½	Bearded..	40	20	62½	"
12	American Bronze	" 13	309	47—49	Very stiff.	3½—4	Beardless.	39	25	62½	"
13	Pride of Illinois... ..	" 17	313	53—55	Stiff	3 —3½	" .	38	30	62½	"
14	Velvet Chaff	" 13	309	52—54	"	2½—3	Bearded..	38	30	62½	No rust.
15	Bonnell..............	" 13	309	54—56	"	3 —3½	Beardless.	38	2	62	"
16	Poole........	" 13	309	48—50	Medium..	2½—3	" .	37	35	62½	"
17	Treadwell	" 17	313	50—52	" ..	3 —3½	Bearded..	37	35	62	Slightly.
18	Tasmania Red.... ..	" 17	313	48—50	Weak	2 —2½	" ..	34	22	62	No rust.
19	Turkey Red..........	" 17	313	45—47	"	2½—3	" ..	32	33	62½	"
20	Long Berry Red	" 13	309	46—48	Medium..	2½—3	" ..	32	5	63	"
21	Dawson's Golden Chaff	* " 17	313	45—47	Stiff	3 —3½	Beardless.	35	20	....	"
22	Surprise......... ...	* " 17	313	41—43	"	3 —3½	" .	26	—	....	"

*Both these varieties were sown October 1st. It will be seen that the same varieties sown September 10th produced larger crops.

EXPERIMENTS WITH SPRING WHEAT.

One hundred and seventeen varieties of spring wheat were included in the trial plots in 1901. The soil was a mixed clay and sandy loam, in some parts the clay predominated, in others it was more sandy. The previous crop was field roots. The land received a dressing of fresh barn-yard manure, of about twelve tons per acre, during the winter of 1899-1900 which was put on the frozen ground in small heaps of about one-third of a cart load each and spread and ploughed under in the spring. No manure has been applied since. In the autumn of 1900 the roots were gathered, the land was ploughed about seven inches deep, and left in that condition until the following spring when it was cultivated twice with a two-horse cultivator and harrowed twice with the smoothing harrow before the wheat was sown.

The size of the plots was one-fortieth of an acre each, and they were all sown at the rate of one bushel and a half of seed per acre.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
1	Goose	Aug. 6	110	44—46	Stiff	2 —2½	Bearded	33	50	64½	No rust.
2	Hastings	July 28	101	44—46	"	3 —3½	Beardless	33	50	60	"
3	Huron	" 31	104	46—48	"	3½—4	Bearded	32	..	61	"
4	Herisson Bearded	Aug. 1	105	44—46	"	2 —2½	"	32	..	64½	"
5	White Fife	" 6	110	52—54	"	4 —4¼	Beardless	31	10	59	Slightly.
6	Beaudry	" 6	110	48—50	Medium	3¾—4¼	Bearded	29	50	61	"
7	No. 19, Australian	" 8	112	43—45	Stiff	3¼—3¾	Beardless	29	10	59	"
8	Red Fife	" 5	109	49—51	"	3¼—4	"	29	10	59½	"
9	Hungarian	" 1	105	42—44	Medium	3½—4	Bearded	29	10	61	"
10	Preston	July 31	104	40—42	"	3½—4	"	28	40	58	No rust.
11	No. 181, Minnesota	Aug. 1	105	48—50	Stiff	3 —3½	Beardless	28	40	61½	"
12	Beauty	" 7	111	46—48	"	4 —4½	"	28	30	56½	Considerably.
13	No. 5642, Washington	" 8	104	44—46	Medium	2¼—3	Bearded	28	30	62	Slightly.
14	Dion's	" 7	111	46—48	Stiff	4 —4½	"	27	50	60½	"
15	Campbell's White Chaff	" 2	106	50—52	"	3½—4	Beardless	27	50	58	No rust.
16	Plumper	July 31	104	44—46	"	3½—4	Bearded	27	20	63	Slightly.
17	No. 15, Australian	Aug. 11	104	46—48	"	2¾—3¼	Beardless	27	10	60	Considerably.
18	Kingsford	" 5	98	44—46	"	3 —3½	"	27	10	59	Slightly.
19	No. 13, Australian	" 9	113	45—47	"	3½—4¼	"	27	10	59	Considerably.
20	No. 10, Australian	" 7	111	45—47	"	4 —4½	"	26	30	59	"
21	Clyde	July 31	104	48—50	"	4 —4½	"	26	30	60	No rust.
22	Crown	Aug. 1	105	40—42	"	3½—4	Bearded	26	30	59½	"
23	Boyle	" 6	99	51—53	Medium	3½—4	Beardless	26	30	58½	Considerably.
24	No. 5644, Washington	" 7	105	40—42	Stiff	1¾—2¼	Bearded	26	30	63	Slightly.
25	Nixon	" 8	101	46—48	"	3½—4	Beardless	26	30	60	"
26	No. 5639, Washington	" 8	104	42—44	"	2 —2¼	Bearded	25	50	62	"
27	Perron (Les Eboulements)	" 6	99	45—47	"	3½—4	Beardless	25	50	58	Considerably.
28	Old Red River	" 11	104	47—49	Medium	3¾—4¼	"	25	10	60½	Badly.
29	Rio Grande	" 7	111	49—51	Stiff	3¾—4¼	Bearded	25	10	61	Slightly.
30	Blenheim	" 1	105	41—43	Medium	3½—4	"	24	40	60½	No rust.
31	Grant	" 8	101	44—46	Stiff	3 —3½	Beardless	24	30	60	Slightly.
32	No. 1, Australian	" 12	105	46—48	"	3¼—3¾	"	24	30	60	"
33	Emporium	" 9	103	49—51	Medium	4 —4¼	Bearded	24	10	60	Considerably.
34	Percy	July 31	104	46—48	Stiff	4 —4½	Beardless	24	..	60	No rust.
35	Chester	Aug. 1	105	39—41	"	3½—4	"	23	50	61	"
36	Tracey	" 11	104	49—51	"	3½—4¼	"	23	50	59	Considerably.
37	No. 169, Minnesota	" 2	106	42—44	"	3½—4	"	23	20	60	No rust.
38	Pringle's Champlain	July 31	104	41—43	"	3½—4	Bearded	23	20	61½	"
39	No. 163, Minnesota	Aug. 2	106	42—44	"	3 —3½	Beardless	23	20	59	"
40	Wellman's Fife	" 6	110	52—54	"	4 —4¾	"	23	10	59	Considerably.
41	No. 27, Australian	" 6	110	49—51	"	3¾—4¼	"	23	10	57	Slightly.
42	Steinmedal fr. Victoria, Aust.	" 7	103	40—42	"	3 —3½	"	23	10	56	Considerably.
43	Cartier	" 1	105	40—42	"	3 —3½	Bearded	23	10	60½	No rust.
44	Roumanian	" 7	111	42—44	"	3 —3½	"	23	10	63¼	Slightly.
45	Early Riga	July 21	94	42—44	"	3 —3½	Beardless	22	40	61	"
46	Prospect	Aug. 6	99	46—48	"	3 —3½	"	22	30	57	"
47	Dayton	" 5	98	45—47	"	3½—4	Bearded	22	30	58	"
48	Red Fern	" 2	106	46—48	"	4½—5	"	22	30	62½	No rust.
49	Colorado	" 1	105	46—48	Medium	3½—4	"	22	..	62	"
50	Dawn	July 31	104	40—42	Stiff	4 —4½	Beardless	22	..	59	"
51	Captor	Aug. 1	105	43—45	"	3½—4	"	22	..	60½	Slightly.
52	Rideau	" 1	105	43—45	"	3½—4	"	22	..	58¾	No rust.
53	No. 5645, Washington	" 9	105	45—47	"	2¼—2¾	Bearded	21	50	62½	Badly.
54	No. 12, Australian	" 5	98	39—41	"	3¼—4	Beardless	21	50	58	Slightly.
55	No. 23, Australian	" 7	111	47—49	"	4 —4¾	"	21	50	58	"
56	Speltz	" 7	111	36—38	Medium	2 —2¼	Bearded	21	50	40	"
57	Lakefield	" 6	99	46—48	"	3½—4	Beardless	21	10	57	Badly.
58	Laurel	" 8	112	48—50	Stiff	3¾—4¼	"	21	10	59	Considerably.
59	Morley	" 8	101	42—44	"	4 —4½	"	21	10	58	Slightly.
60	White Connell	" 8	112	42—44	"	3½—4¼	"	21	10	59½	"
61	White Russian	" 7	111	47½—48½	"	4¼—5	"	21	10	59	"
62	Admiral	" 8	112	44—46	"	3¼—4	"	21	10	58	Considerably.
63	No. 5646, Washington	" 7	103	38—40	"	2 —2¼	Bearded	21	10	62½	"
64	No. 2, Australian	" 12	105	46—48	"	3¾—4¼	Beardless	20	50	60	"

SPRING WHEAT—TEST OF VARIETIES—*Concluded.*

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.	Rusted.
				Inches.		Inches.		Bush.	Lbs.	Lbs.	
65	Alpha	Aug. 1	105	42—44	Stiff	4 —4½	Beardless.	20	40	61	No rust.
66	Robin's Rust Proof..	" 8	112	49—51	"	3¼—4	" .	20	40	58½	Considerably.
67	Benton....	" 1	105	41—43	"	3½—4	" .	20	40	62	Slightly.
68	Advance	July 31	104	41—43	"	3 —3½	Bearded. .	20	40	61¼	No rust.
69	Monarch	Aug. 6	110	46—48	"	4¼—4¾	Beardless.	20	30	59	Slightly.
70	No. 11, Australian...	" 11	104	45—47	"	3¾—4¼	" .	20	30	57½	Considerably.
71	Orleans	" 8	101	48—50	"	3½—4	" .	20	30	59	Slightly.
72	Blair........	" 1	105	40—42	"	3 —3½	" .	20	—	63½	"
73	Countess	" 2	106	46—48	"	3 —3½	" .	20	—	60½	No rust.
74	Red Swedish..	" 7	111	48—50	"	4 —4¾	Bearded..	19	50	58	Slightly.
75	From Kerr Gifford, Portland, O.......	" 7	103	36—38	"	1½—1¾	Beardless.	19	50	56	Badly.
76	Newdale...........	" 5	98	39—41	"	3 —3½	" .	19	50	59	Slightly.
77	Robson............	" 6	99	49—51	"	4 —4½	" .	19	50	56	Considerably.
78	Redpath..	" 8	101	48—50	"	4 —4½	" .	19	50	...	Slightly.
79	Spence	" 5	98	45—47	"	3 —3½	Bearded..	19	50	57	"
80	Progress	July 28	101	44—46	"	4 —4½	Beardless.	19	50	58	No rust.
81	No. 25, Australian...	Aug. 7	111	48—50	"	4½—5	" .	19	50	56	Considerably.
82	Dawson	" 12	105	48—50	Medium..	3¾—4¼	" .	19	50	59½	"
83	No. 149, Minnesota..	" 2	106	43—45	Stiff......	3 —3½	" .	19	40	62	Slightly.
84	Harold	July 21	94	42—44	"	2½—3	Bearded..	19	40	61½	"
85	No. 9, Australian....	Aug. 2	106	42—44	"	3½—4	" .	19	30	58	Considerably.
86	Stanley	July 31	104	39—41	"	3½—4	Beardless.	19	20	60	No rust.
87	Norval...........	" 28	101	42—44	"	3 —3½	Bearded..	19	20	61½	"
88	No. 28, Australian...	Aug. 6	99	42—44	"	3½—4	Beardless.	19	10	58	Slightly.
89	Dufferin..........	" 1	105	41—43	"	3 —3½	Bearded..	19	10	60	No rust.
90	Florence......	" 6	99	47—49	"	3½—4	Beardless.	19	10	61	Slightly.
91	Essex	" 8	112	45—47	"	3¾—4¼	" .	19	10	58	"
92	Crawford..........	July 28	101	42—44	"	3½—4	" .	19	—	61	No rust.
93	Fraser..	" 22	95	39—41	"	3 —3½	Bearded..	18	40	62½	"
94	Angus.............	Aug. 1	105	45—47	"	3 —3½	Beardless.	18	40	60	Slightly.
95	Weldon	" 1	105	42—44	"	3½—4	" .	18	40	61	No rust.
96	Polonian	" 9	102	41—43	Medium..	5½—6	Bearded..	18	30	56	Considerably.
97	No. 5643, Washington..............	" 7	105	37—39	" ..	2¾—3¼	" .	17	50	61	Slightly.
98	Byron..	July 31	104	39—41	Stiff......	3 —3½	" .	17	50	59¼	No rust.
99	Japanese	" 24	97	36—38	"	3 —3½	" .	17	20	61	Slightly.
100	Cassel..	Aug. 8	112	43—45	"	3¾—4¼	Beardless.	17	10	58	"
101	Vernon	" 1	105	39—41	"	3½—4	Bearded..	17	10	59	No rust.
102	No. 21, Australian...	" 6	99	40—42	"	3½—4	Beardless.	17	10	59	Considerably.
103	Summer No. 9, Norway............	July 28	93	36—38	"	3 —3½	" .	17	10	52	Slightly.
104	Mason.............	Aug. 1	105	39—41	Medium..	3 —3½	" .	16	40	62	"
105	No. 18, Australian...	" 11	104	39—41	Stiff......	2¾—3¼	" .	16	30	60½	Considerably.
106	Strubes	" 7	100	42—44	"	3½—4½	Bearded..	16	30	60¼	Slightly.
107	Gehun.............	" 2	93	42—44	"	2½—3	" .	16	30	59½	"
108	Ebert	July 22	95	38—40	Medium..	2½—3	Beardless.	15	20	63	"
109	No. 5799, Washington...............	Aug. 9	105	41—43	" ..	5½—6	Bearded..	15	10	56	Considerably.
110	No. 7, Felbrig Australian.....	" 8	101	45—47	Stiff......	3¾—4½	Beardless.	15	10	58	"
111	Ladoga	July 27	100	35—37	"	3 —3½	Bearded..	14	40	57	No rust.
112	Bishop	Aug. 1	105	39—41	"	3½—4	Beardless.	13	50	60	"
113	Powell	" 8	96	41—43	"	3 —3½	" .	13	10	57	Slightly.
114	No. 14, Australian. .	" 8	101	39—41	"	3¼—4	" .	13	10	59	"
115	Leutewitzer Sand...	" 5	98	37—39	"	3½—4	Bearded..	13	10	58¼	"
116	Black Sea	" 2	95	38—40	"	3 —3½	" .	13	10	55¼	"
117	No. 2959, Washington..............	" 7	103	39—41	"	2½—3	" .	13	10	61½	"

In the foregoing list there are a number of new varieties including four new sorts from Prof. W. U. Hays, Agriculturist of the Minnesota Experiment Station. These have been sent out under numbers. There are also some additional varieties from Australia under numbers. From the United States Department of Agriculture the following have been received:—Nos. 5642, 5644, 5639, 5645, 5646, 5643, 5799 and 2599.

There are also included in this list fifty-four cross-bred sorts which have been originated at the experimental farms. The names of these are Admiral, Advance, Alpha, Angus, Beauty, Benton, Bishop, Blair, Blenheim, Boyle, Byron, Captor, Cartier, Cassel, Chester, Clyde, Countess, Crawford, Crown, Dawn, Dawson, Dayton, Dufferin, Early Riga, Ebert, Essex, Florence, Fraser, Grant, Harold, Hastings, Huron, Kingsford, Lakefield, Laurel, Mason, Morley, Newdale, Nixon, Norval, Orleans, Percy, Plumper, Powell, Preston, Progress, Prospect, Redpath, Robson, Spence, Stanley, Tracey, Weldon and Vernon.

The origin and parentage of all these, excepting thirteen, will be found in the annual reports for 1896-7-8 and 1900.

The thirteen now added are the following:—

No. 46. Dayton, bearded. Prince, female; Hard Red Calcutta, male.

No. 47. Grant, beardless. Alpha, female; Gehun, male.

No. 48. Kingsford, beardless. Red Fife, female ; Gehun, male.

No. 49. Lakefield, beardless. Campbell's White Chaff, female; Ladoga, male.

No. 50. Morley, beardless. Red Fife, female; No. 1 Club Bombay, male.

No. 51. Newdale, beardless. Gehun, female; Campbell's White Chaff, male.

No. 52. Nixon, beardless. Onega, female; Red Fife, male.

No. 53. Orleans, beardless. Red Fife, female; Campbell's White Chaff, male.

No. 54. Prospect, beardless. Rideau, female; Red Fife, male.

No. 55. Robson, beardless. White Fife, female; Hard Red Calcutta, male.

No. 56. Redpath, beardless. Red Fife, female; Campbell's White Chaff, male.

No. 57. Spence, bearded. Alpha, female; Hard Red Calcutta, male.

No. 58. Tracey, beardless. Silver Chaff, female; Anglo-Canadian, male.

Of these results in cross-fertilizing two are bearded varieties and eleven are beardless. Four of these were originated at the Central Experimental Farm by the Director, Nos. 49 and 58 in 1890, and Nos. 48 and 51 in 1892. One by Dr. C. E. Saunders in 1896, No. 54; three by Mr. W. T. Macoun in 1892, Nos. 46, 52 and 57, and one by Mr. J. L. McMurray in 1890, No. 50. Four were originated by Dr. A. P. Saunders in 1892, two of them, Nos. 53 and 55 at the Experimental Farm at Brandon, Manitoba; one, No. 56, at the farm at Indian Head, N.W.T., and one, No. 47, at the farm at Agassiz, British Columbia.

SELECT LIST OF VARIETIES OF SPRING WHEAT.

In this list is given the average yield per acre obtained during the past three to seven years from the most productive varieties of spring wheat grown at all the experimental farms, with the length of time they have been under test. Only those are included which have been three years or longer under trial. The bearded and beardless sorts are also marked. Further particulars regarding these select lists will be found under 'Select list of oats.'

Number.	Names of varieties.	Head Bearded or Beardless.	Number of Years under trial.	Average Yield per acre at all the Experimental Farms. Bush.	Lbs.
1	Roumanian	Bearded	3	39	44
2	Laurel	Beardless	3	35	38
3	Preston	Bearded	7	33	58
4	Wellman's Fife	Beardless	7	33	8
5	Monarch	"	7	33	8
6	Goose	Bearded	7	32	50
7	Huron	"	7	32	45
8	Red Fife	Beardless	7	32	30
9	White Fife	"	7	32	29
10	Hungarian	Bearded	6	32	10
11	White Connell	Beardless	7	32	6
12	White Russian	"	7	32	6
13	Rio Grande	Bearded	7	32	6
14	Clyde	Beardless	3	32	6
15	Crawford	"	3	32	3
16	Pringle's Champlain	Bearded	7	31	56
17	Red Fern	"	7	31	31
18	Crown	"	7	31	21
19	Stanley	Beardless	7	31	19
20	Blair	Bearded	4	31	7
21	Advance	"	7	30	58
22	Alpha	Beardless	7	30	53
23	Percy	"	7	30	24
24	Admiral	"	7	30	23
25	Fraser	Bearded	3	30	16
26	Blenheim	"	7	30	12
27	Weldon	Beardless	3	30	12
28	Red Swedish	Bearded	3	30	12
29	Progress	Beardless	6	30	5
30	Ebert	"	3	30	5
31	Vernon	Bearded	6	29	59
32	Dion's	"	7	29	53
33	Colorado	"	7	29	50
34	Countess	Beardless	6	29	48
35	Plumper	Bearded	4	29	40
36	Herisson Bearded	"	7	29	40
37	Mason	Beardless	4	29	38
38	Early Riga	"	3	29	36
39	Beauty	"	6	29	35
40	Dawn	"	6	29	30
41	Rideau	"	7	29	22
42	Campbell's White Chaff	"	7	29	16
43	Beaudry	Bearded	7	29	3
44	Byron	"	3	28	56
45	Dufferin	"	6	28	39
46	Captor	Beardless	7	28	7
47	Norval	Bearded	3	27	24
48	Ladoga	"	7	27	11
49	Harold	"	4	26	39

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY AND CLAY LOAM.

These experiments were all conducted on plots of one-fortieth acre each on both sandy loam and clay loam. It will be noticed that the crops are heaviest on the clay loam in every instance.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Rusted.
				Inches.		Inches.		Bus.	Lbs	
WHEAT SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM SOIL.										
Preston 1 bush per acre........	April 29	Aug. 7	100	45—47	Stiff......	3½—4	Bearded...	10	20	Slightly.
Preston 1¼ bush. per acre........	" 29	" 7	100	45—47	"	3½—4	" ...	15	—	"
Preston 1½ bush. per acre........	" 29	" 7	100	45—47	"	3½—4	" ...	19	40	"
Preston 2 bush. per acre.......	" 29	" 7	100	45—47	"	3½—4	" ...	20	20	"
Preston 2½ bush. per acre.......	" 29	" 7	100	42—44	Medium..	3 —3½	" ...	21	—	"
Preston 3 bush. per acre.......	" 29	" 7	100	42—44	" ..	3 —3½	" ...	19	40	"
WHEAT SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM SOIL.										
Preston 1 bush. per acre........	" 27	" 2	97	48—50	Stiff....	3½—4	" ...	28	20	"
Preston 1¼ bush. per acre........	" 27	" 2	97	48—50	"	3½—4	" ...	28	20	"
Preston 1½ bush. per acre........	" 27	" 2	97	48—50	"	3½—4	" ...	29	—	"
Preston 2 bush. per acre........	" 27	" 2	97	48—50	Medium..	3½—4	" ...	26	20	Considerably.
Preston 2½ bush. per acre........	" 27	" 2	97	48—50	" ..	3½—4	" ...	26	20	"
Preston 3 bush. per acre........	" 27	" 2	97	48—50	Weak	3 —3½	" ...	25	—	"
OATS SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM SOIL.										
Banner 1½ bush. per acre........	" 29	" 3	96	42—44	Stiff......	8 —9	Branching.	41	6	Slightly.
Banner 2 bush. per acre........	" 29	" 3	96	42—44	"	8 —9	" .	59	14	"
Banner 2½ bush. per acre........	" 29	" 3	96	40—42	Medium..	8 —9	" .	57	2	"
Banner 3 bush. per acre........	" 29	" 3	96	40—42	" ..	8 —9	" .	43	18	"
Banner 3½ bush. per acre........	" 29	" 3	96	30—32	Weak	7 —8	" .	31	26	"
Banner 4 bush. per acre.......	" 29	" 3	96	30—32	"	7 —8	" .	35	10	"
OATS SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM SOIL.										
Banner 1½ bush. per acre........	" 27	July 28	92	46—48	Stiff......	9—10	" .	58	28	"
Banner 2 bush. per acre........	" 27	" 28	92	46—48	"	9—10	" .	65	30	"
Banner 2½ bush. per acre........	" 27	" 28	92	49—51	"	9—10	" .	67	2	"
Banner 3 bush. per acre........	" 27	" 28	92	49—51	Medium..	9—10	" .	64	24	"
Banner 3½ bush. per acre........	" 27	" 28	92	40—42	" ..	9—10	" .	61	6	"
Banner 4 bush. per acre........	" 27	" 28	92	34—36	Weak . ..	9—10	" .	57	22	"

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Rusted.
				Inches.		Inches.		Bus.	Lbs	
BARLEY SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM SOIL.										
Mensury 1½ bush. per acre......	" 29	" 22	84	39—41	Stiff......	3 —3½	....	35	35	None.
Mensury 2 bush. per acre.......	" 29	" 22	84	39—41	"	3 —3½	....	37	19	"
Mensury 2½ bush. per acre........	" 29	" 22	84	39—41	Medium..	3 —3½	....	43	11	"
Mensury 3 bush. per acre........	" 29	" 22	84	39—41	" ..	3 —3½	....	42	19	"
Mensury 3½ bush. per acre........	" 29	" 22	84	39—41	" ..	3 —3½	....	39	23	"
Mensury 4 bush. per acre........	" 29	" 22	84	36—38	" ..	3 —3½	....	43	11	"
BARLEY SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM SOIL.										
Mensury 1½ bush. per acre........	" 27	" 19	83	39—41	Stiff......	3 —3½	....	37	—	"
Mensury 2 bush. per acre.......	" 27	" 19	83	39—41	"	3 —3½	....	40	35	"
Mensury 2½ bush. per acre........	" 27	" 19	83	43—45	"	3 —3½	....	44	3	"
Mensury 3 bush. per acre......	" 27	" 19	83	41—43	Medium..	3 —3½	....	45	35	"
Mensury 3½ bush. per acre........	" 27	" 19	83	40—42	Weak	3 —3½	....	45	35	"
Mensury 4 bush. per acre........	" 27	" 19	83	40—42	"	3 —3½	....	44	3	"

EXPERIMENTS WITH PEASE.

Sixty-one varieties of pease have been under trial in the uniform test plots during the past season. The soil on which these pease were sown was a sandy loam, which received a dressing of barn-yard manure during the winter of 1898-9 of about 12 tons per acre. The previous crop was oats. After the oats were taken off the land was cultivated shallow shortly after harvest to start shed grain and weed seeds, and ploughed again later in the autumn about 8 inches deep, and left in this condition until the following spring, when it was cultivated twice with a two-horse cultivator and twice with a smoothing harrow. The seed of all the varieties was sown on April 29 on plots of one-fortieth of an acre each, at the rate of two to three bushels per acre according to the size of the pea.

PEASE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bushel.
					Inches.	Inches.	Bush.	Lbs.	Lbs.
1	Cooper	Aug. 15	108	Strong	74—80	2¼—2½	33	20	61½
2	English Gray	″ 15	108	″	75—80	2¼—2¾	32	..	59
3	Paragon	″ 2	95	″	35—40	1¾—2¼	32	..	61
4	Nelson	″ 6	99	″	50—55	2¼—2¾	32	..	61½
5	French Canner	″ 12	105	Medium	90—96	2¼—3	31	40	61
6	Bruce	″ 18	111	Very strong.	70 75	2½—2¾	31	40	61½
7	Centennial	″ 20	113	Medium	65—70	2¼—2¾	31	20	61
8	Vincent	″ 20	113	Strong	70—75	2½—2¾	30	40	61
9	Elder	″ 14	107	″	75—80	2 —2¼	30	40	61½
10	Chancellor	″ 3	96	″	65—70	1½—2	30	40	62½
11	Kent	″ 14	107	Very strong.	65—70	2½—2¾	30	40	62
12	Victoria	″ 21	114	″	70—75	2¼—2¾	30	..	61½
13	Carleton	″ 14	107	″	80—85	2¼—2¾	30	..	62½
14	Alma	″ 14	107	Medium	65—70	2¼—3	30	..	61
15	Arthur	″ 15	108	Very strong.	60—65	2¼—2¾	30	..	61
16	Elliot	″ 13	106	″	65—70	2¼—2¾	30	..	62
17	King	″ 18	111	Strong	75—80	2¼—2¾	29	20	61
18	Canadian Beauty	″ 13	106	Very strong.	72—76	2½—3	29	20	60½
19	Picton	″ 15	108	″	72—78	2 —2¼	29	20	61½
20	Golden Vine	″ 13	106	Strong	70—75	2 —2¼	29	..	62½
21	Lanark	″ 12	105	″	76—82	2½—2¾	29	..	60
22	Bright	″ 16	109	″	72—78	2½—2¾	28	..	61½
23	Bedford	″ 15	108	Very strong.	90—95	2¼—2¾	28	..	62
24	Large White Marrowfat	″ 14	107	″	72—78	2¾—3¼	28	..	61
25	Perth	″ 14	107	Strong	68—72	2½—2¾	28	..	61
26	Prussian Blue	″ 6	99	″	68—75	2½—2¾	27	20	61½
27	Mackay	″ 10	103	Very strong.	68—72	1¾—2¼	27	20	61½
28	Pride	″ 12	105	Strong	65—70	2 —2¼	27	20	62½
29	Mummy	″ 15	108	″	70—75	2¼—2¾	27	20	61½
30	Pearl	″ 21	114	Medium	60—65	2½—2¾	27	20	62
31	Field Gray	″ 16	109	″	65—70	2 —2¼	27	20	62
32	Prince	″ 13	106	Strong	70—75	2½—3	26	40	62
33	Daniel O'Rourke	″ 5	98	″	55—60	1¾—2¼	26	40	63
34	Creeper	″ 12	105	″	68—72	2 —2½	26	40	62½
35	New Potter	″ 20	113	Strong	72—78	2¼—2½	26	40	61
36	Wisconsin Blue	″ 17	110	″	62—68	2 —2¼	26	..	63
37	Duke	″ 15	108	″	57—61	2 —2½	26	..	61½
38	Oddfellow	″ 15	108	Very strong.	50—55	1¾—2¼	26	..	63
39	Agnes	″ 14	107	″	65—70	2½—3	26	..	62
40	Black Eyed Marrowfat	″ 19	112	Strong	70—75	2¼—2¾	25	40	60
41	White Wonder	″ 7	100	Medium	34—38	2 —2½	25	20	62
42	Archer	″ 18	111	Strong	70—75	2¼—2¾	25	..	61½
43	Macoun	″ 19	112	″	55—60	2¼—2½	24	40	61½
44	Multiplier	″ 19	112	″	72—76	2¼—2½	24	40	61½
45	Gregory	″ 11	104	″	70—75	2 —2½	24	40	61
46	Early Britain	″ 13	106	″	50—55	2¼—2½	24	40	58½
47	Crown	″ 13	106	Medium	70—75	2 —2¼	24	20	63
48	Harrison's Glory	″ 11	104	Strong	54—58	2¼—2½	24	..	61½
49	Elephant Blue	″ 13	106	Very strong.	70—75	2¼—3	24	..	60
50	Prince Albert	″ 21	114	Strong	70—75	2¼—2½	24	..	59½
51	Fergus	″ 17	110	″	70—75	2¼—2½	24	..	61
52	Chelsea	″ 19	112	″	70—75	2 —2¼	23	40	61½
53	Dover	″ 15	108	″	57—61	2 —2½	22	40	62
54	Herald	″ 20	113	″	65—70	2¼—2¾	21	20	61½
55	Fenton	″ 10	103	″	72—76	2¼—2¾	20	.	59
56	Trilby	″ 12	105	″	62—68	2¼—2¾	19	20	61½
57	Maple	″ 21	114	″	68—72	2¼—2½	18	40	58½
58	German White	″ 7	100	″	70—75	1¾—2½	18	20	61
59	Grass Pea	″ 21	114	″	55—60	1 —1¼	16	40	63½
60	Grey (Pisum Arvense, No. 13 fr. Norway)	″ 6	99	Medium	36—38	¾—1¼	12	..	61½
61	Marrowfat (fr. Norway)	″ 5	98	″	46—48	2 —2¼	8	..	58½

The foregoing list includes the following thirty cross-bred sorts, all of which have been originated at the experimental farms:—Agnes, Alma, Archer, Arthur, Bedford, Bright, Bruce, Carleton, Chelsea, Cooper, Dover, Duke, Elder, Elliot, Fenton, Fergus,

Gregory, Herald, Kent, King, Lanark, Mackay, Macoun, Nelson, Pearl, Perth, Picton, Prince, Trilby and Vincent.

SELECT LIST OF VARIETIES OF PEASE.

In this list is given the average yield per acre obtained during the past three to seven years from the most productive varieties of pease grown at all the experimental farms, with the length of time they have been under test. Only those are included which have been three years or longer under trial. Further particulars regarding these select lists will be found under 'Select list of oats.'

Number.	Names of Varieties.	Number of Years under trial.	Average Yield per acre at all the Experimental Farms.	
1	Crown	7	36	40
2	German White	4	36	1
3	Pride	7	36	
4	Carleton	6	35	36
5	Picton	4	35	31
6	Chelsea	3	35	15
7	Early Britain	5	34	53
8	King	5	34	36
9	New Potter	7	34	30
10	Paragon	6	34	26
11	Duke	6	34	23
12	English Gray	3	34	15
13	Lanark	4	34	12
14	Pearl	3	34	10
15	Wisconsin Blue	3	34	2
16	Perth	5	33	53
17	Agnes	6	33	52
18	Archer	5	33	50
19	Gregory	4	33	42
20	Elliot	3	33	42
21	Arthur	6	33	37
22	Mummy	7	33	36
23	Fergus	4	33	30
24	Trilby	6	33	27
25	Chancellor	5	33	25
26	White Wonder	5	33	25
27	Centennial	7	33	21
28	Nelson	5	33	19
29	Bruce	3	33	14
30	Kent	6	33	9
31	Prussian Blue	5	33	5
32	Victoria	5	33	3
33	Prince Albert	7	32	58
34	Golden vine	7	32	58
35	Mackay	6	32	41
36	Prince	6	32	40
37	Dover	3	32	39
38	Black Eyed Marrowfat	7	32	37
39	Macoun	6	32	36
40	Vincent	5	32	24
41	Creeper	6	32	23
42	Oddfellow	5	32	18
43	French Canner	4	32	15
44	Elder	3	32	10
45	Bright	5	31	59
46	Large White Marrowfat	6	31	45
47	Fenton	4	31	44
48	Canadian Beauty	7	31	41
49	Elephant Blue	5	31	38
50	Daniel O'Rourke	6	31	35
51	Cooper	4	31	30
52	Alma	5	31	29
53	Bedford	6	31	25
54	Herald	3	31	15
55	Multiplier	7	31	3
56	Harrison's Glory	5	30	57

EXPERIMENTS WITH INDIAN CORN.

Thirty-seven varieties of Indian corn were tested during the season of 1900, side by side, on fairly uniform land. The soil was a sandy loam of good quality, which received a dressing of barn-yard manure, about twelve tons to the acre, during the winter of 1900-1. This was placed on the frozen land fresh from the barn-yard, in small heaps of about one-third of a cart load each, and spread and ploughed under in the spring. The previous crop was wheat. The land was gang-ploughed shallow shortly after wheat harvest to start weed seeds and shed grain, and ploughed again in the autumn seven or eight inches deep. In the spring of 1901, after the manure was spread and ploughed under, it was harrowed twice with the smoothing harrow before sowing. The corn was sown with the seed drill, in rows three feet apart, also in hills three feet apart each way; when the plants were from five to seven inches high they were thinned so as to leave them from six to eight inches apart in the rows, and from four to five kernels were left in each hill. The varieties were all sown on May 28, and were cut for ensilage on September 18. The yield per acre has been calculated from the weight of the crop cut from two rows, each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
			Inches.			Tons.	Lbs.	Tons.	Lbs.
1	Superior Fodder	Strong	120—130	Leafy	Glazed	24	840	25	820
2	Early Mastodon	Very strong	120—130	"	Doughy	24	400	24	840
3	Early Butler	"	110—120	Very leafy	Late milk	23	1,300	19	940
4	Thoro'bred White Flint	"	115—120	"	"	23	200	23	640
5	Extra Early Huron	"	115—125	Leafy	"	22	1,760	25	1,480
6	Cloud's Early Yellow	"	120—125	"	"	22	1,540	20	40
7	Giant Prolific Ensilage	"	120—130	"	"	22	1,540	19	1,600
8	Selected Leaming	"	120—130	"	Glazed	22		23	860
9	Red Cob Ensilage	"	120—130	Very leafy	Late milk	22		21	20
10	Evergreen Sugar	Strong	105—115	Leafy	Early milk	21	1,120	18	520
11	Champion White Pearl	Very strong	110—120	"	Late milk	21	460	15	1,020
12	Rennie's B. B.	"	125—130	"	Early milk	21	460	19	940
13	Country Gentleman	Medium	94—110	"	"	20	1,360	16	120
14	Sanford	Strong	120—125		Late milk	19	1,820	17	1,200
15	Salzer's All Gold	Very strong	115—125	"	Early milk	19	1,380	22	440
16	Mammoth Cuban	"	125—135	Very leafy	"	19	940	26	140
17	Canada White Flint	Strong	90—120	Leafy	Late milk	18	1,840	17	100
18	Rennie's Victoria Yellow	Very strong	130—140	"	Glazed	18	1,840	17	100
19	Pride of the North	"	105—115	"	Late milk	18	1,820	11	1,760
20	Compton's Early	Medium	95—105	Leafy	Glazed	18	1,620	14	1,480
21	White Cap Yellow Dent	Very strong	120—130	Very leafy	Early milk	18	1,300	19	500
22	Rennie's Earliest Ontario	Strong	105—115	Medium	"	18	300	20	1,360
23	King of the Earliest	"	105—115	Leafy	Doughy	18	80	18	1,620
24	Mamm. Eight-rowed Flint	Medium	95—105	"	Glazed	17	1,420	22	
25	Black Mexican	"	90—100	"	"	16	1,660	14	1,480
26	Early Yellow Long Eared	"	105—110	"	Ripe	16	1,220	15	1,900
27	Longfellow	Strong	95—105	"	Glazed	15	360	20	40
28	North Dakota White	Medium	90— 95	"	"	14	1,700	19	500
29	Angel of Midnight	Strong	90—102	Fairly leafy	"	14	1,480	15	1,460
30	Pearce's Prolific	"	85— 95	Medium	"	14	1,260	18	520
31	North Dakota Yellow	Medium	80— 90	Leafy	"	14	1,040	18	1,400
32	Kendall's Early Giant	Weak	65— 75	"	Doughy	13	1,280	16	560
33	Early August	"	80— 90	Medium	Ripe	10	240	8	1,160
34	Salzer's Earliest Ripe	"	65— 75	"	"	9	700	10	1,120
35	Extra Early Szekely	"	65— 75	Leafy	"	9	260	11	440
36	Yellow Six Weeks	"	65— 75	Medium	"	9	40	9	1,360
37	Mitchell's Extra Early	"	60— 65	"	"	8	1,600	11	1,100

INDIAN CORN PLANTED AT DIFFERENT DISTANCES.

Three varieties were chosen for this test, the Champion White Pearl, Selected Leaming and Longfellow. They were sown in rows at different distances apart. The

soil was the same as that used for the test of varieties, and its treatment and preparation were the same. The corn was sown with the seed drill on May 28, and was cut for ensilage September 18. Four rows were sown in each case, and the yield per acre has been calculated from the weight of crop obtained from the two inside rows, each 66 feet long.

Name of Variety.	Width of Row.	Character of Growth.	Height when Cut.	Condition when Cut.	Weight per Acre.	
	Inches.		Inches.		Tons.	Lbs.
Champion White Pearl	21	Strong	120—130	Late milk.	27	665
" "	28	"	120—130	"	26	72
" "	35	Very strong.	125—135	"	24	1,720
" "	42	"	125—135	"	24	1,444
Selected Leaming	21	Strong	115—125	Glazed	24	1,010
"	28	"	115—125	"	20	186
"	35	Very strong.	125—135	"	19	194
"	42	"	125—135	"	21	1,902
Longfellow	21	Strong	95—100	"	20	1,470
"	28	"	95—100	"	19	770
"	35	Very strong.	100—110	"	18	838
"	42	"	100—110	"	17	1,156

SELECT LIST OF VARIETIES OF INDIAN CORN.

In this list is given the average yield per acre obtained during the past three to seven years from the more productive varieties of Indian corn grown at all the experimental farms, with the length of time they have been under test. Only those are included which have been three years or longer under trial. Fuller particulars regarding these select lists will be found under 'Select list of oats.'

Number.	Names of Varieties.	Number of Years under Trial.	Average Yield per Acre at all the Experimental Farms.	
1	Early Mastodon	4	21	690
2	Cloud's Early Yellow	5	19	1,001
3	Red Cob Ensilage	7	19	651
4	Thoroughbred White Flint	7	19	134
5	Selected Leaming	6	18	1,210
6	Early Butler	5	18	958
7	Mammoth Cuban	4	18	626
8	Giant Prolific Ensilage	7	17	1,976
9	Pride of the North	6	17	1,141
10	Champion White Pearl	7	17	1,054
11	Angel of Midnight	7	17	257
12	Mammoth Eight-rowed Flint	7	16	1,536
13	King of the Earliest	6	16	910
14	Sanford	7	16	627
15	Compton's Early	7	16	545
16	White Cap Yellow Dent	7	16	380
17	Evergreen Sugar	4	16	79
18	Longfellow	7	15	1,921
19	Canada White Flint	7	15	1,762
20	Country Gentleman	3	15	1,123
21	North Dakota White	7	15	983
22	Pearce's Prolific	7	15	505
23	Early Yellow Long Eared	3	14	1,837
24	Kendall's Early Giant	3	14	1,737
25	Black Mexican	3	14	1,127
26	Extra Early Huron Dent	7	14	1,004
27	Extra Early Szekely	3	12	789
28	Mitchell's Extra Early	7	11	1,042
29	Yellow Six Weeks	3	10	1,574

EXPERIMENTS WITH TURNIPS.

Twenty-nine varieties of turnips were on trial during the past season, all sown side by side on similar land. The soil was a clay loam of good quality, more or less mixed with sandy loam. The previous crop was experimental plots of wheat and barley. The land was ploughed early in the autumn of 1900 about eight inches deep. During the winter of 1900-1 this land received a dressing of about 12 tons of fresh barn-yard manure per acre, which was placed on the frozen ground in small piles of about a third of a cart-load each to prevent fermentation. This was spread in the spring, ploughed under about six inches deep, and harrowed with the smoothing harrow. The land was then made up in drills two feet apart, and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. The seed was sown at the rate of three pounds per acre. Two sowings were made of each sort, the first on May 8, the second on May 22. They were also pulled on two different dates. The first pulling was on October 14, and the second on October 28. The yield per acre has been calculated in each case from the weight of roots gathered from one row 66 feet in length.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing 1st Pulling October 14.		Yield per acre from 2nd Sowing 1st Pulling October 14.		Yield per acre from 1st Sowing 2nd Pulling October 28.		Yield per acre from 2nd Sowing 2nd Pulling October 28.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Carter's Elephant	41	1,820	29	80	43	790	37	910
2	Hartley's Bronze	41	1,490	29	80	42	480	30	1,380
3	Drummond Purple Top	40	520	28	760	40	520	32	680
4	Halewood's Bronze Top	39	1,530	28	430	39	1,200	29	1,730
5	Hall's Westbury	37	1,240	27	1,110	39	1,530	32	1,670
6	Sutton's Champion	37	1,240	28	1,090	32	20	30	60
7	Bangholm Selected	36	1,590	25	1,480	39	210	27	450
8	Emperor Swede	36	270	32	1,670	33	660	24	840
9	Champion Purple Top	34	1,300	27	450	40	190	31	40
10	Prize Purple Top	34	310	23	1,520	31	370	25	490
11	Magnum Bonum	33	1,650	24	1,830	35	950	32	680
12	Marquis of Lorne	33	1,320	27	120	30	1,710	24	840
13	New Arctic	33	990	21	240	34	310	29	1,730
14	Selected Purple Top	33	330	28	1,750	29	80	23	530
15	Skirvings	32	1,340	27	1,110	27	780	21	900
16	West Norfolk Red Top	32	1,340	26	800	27	120	21	240
17	Imperial Swede	32	1,340	22	880	35	1,280	28	1,420
18	Selected Champion	32	1,010	25	1,150	34	310	24	510
19	Shamrock Purple Top	32	20	26	1,790	31	700	24	1,830
20	Elephant's Master	31	1,690	20	1,580	37	580	28	1,750
21	Giant King	31	1,360	26	1,460	41	170	30	720
22	Prize Winner	30	1,380	26	140	29	1,730	24	180
23	East Lothian	30	720	27	1,440	36	270	30	1,050
24	Perfection Swede	30	60	29	1,070	31	1,360	26	1,130
25	Kangaroo	27	120	22	1,870	33	660	26	800
26	Monarch	25	490	22	880	18	1,620	21	900
27	Mammoth Clyde	24	180	22	550	33	990	30	720
28	Jumbo	23	1,850	20	590	33	1,320	25	490
29	Webb's New Renown	16	670	17	1,970	23	200	All rotten.	

	Tons.	Lbs.
The average from the 1st sowing, 1st pulling was......	32	1,420
The average from the 2nd sowing, 1st pulling was......	25	1,582
The average from the 1st sowing, 2nd pulling was......	33	1,896
The average from the 2nd sowing, 2nd pulling was......	27	1,381

Increase in Crop of Turnips from early Sowing, also from Late Pulling.

The results given point to the advantage of early sowing. The average yield of turnips from all the varieties from the first sowing and first pulling has exceeded that from the second sowing by 6 tons, 1,838 pounds per acre, and in the case of the second pulling made fourteen days later, the larger weight from the earlier sowing is well maintained, the difference being 6 tons, 515 pounds per acre in favour of early sowing.

The figures given also show that the fourteen days of additional time given to the roots to grow between October 14 and 28, resulted in an average increase in weight in the early sown plots of 1 ton 492 pounds per acre, while those later sown increased in weight during the same period 1 ton 1,799 pounds per acre.

SELECT LIST OF VARIETIES OF TURNIPS.

In this list is given the average yield per acre obtained during the past three to seven years from the more productive varieties of turnips grown at all the experimental farms, with the length of time they have been under test. Only those sorts are included which have been three years or longer under trial.

Number.	Names of Varieties.	Number of Years under trial.	Average Yield per acre at all the Experimental Farms.	
1	Selected Purple Top	7	31	206
2	Perfection Swede	6	31	202
3	Imperial Swede	3	30	1,948
4	Halewood's Bronze Top	5	30	783
5	Hall's Westbury	5	30	579
6	Hartley's Bronze	7	29	1,700
7	Bangholm Selected	5	29	1,648
8	Webb's Renown	3	29	296
9	East Lothian	7	29	174
10	Shamrock Purple Top	5	28	1,698
11	Carter's Elephant	7	28	1,206
12	Prize Winner	6	28	1,119
13	Skirvings	7	28	1,096
14	Drummond Purple Top	4	28	904
15	Jumbo	7	28	704
16	Prize Purple Top	7	28	610
17	Mammoth Clyde	6	28	549
18	Monarch	3	27	1,608
19	New Arctic	3	27	1,434
20	Sutton's Champion	6	27	1,280
21	Giant King	7	27	820
22	West Norfolk Red Top	3	27	502
23	Champion Purple Top	7	27	130
24	Marquis of Lorne	6	26	1,337

EXPERIMENTS WITH MANGELS.

Twenty-five varieties of mangels were under trial in 1901. These were all sown, side by side, adjoining the turnips; the land was similar in character and its treatment and preparation was the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made of each sort, the first on May 8, the second on May 22. They were also pulled on two different dates, the first pulling was on October 14, and the second on October 28. The yield per acre has been calculated in each case from the weight of roots gathered from one row 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing 1st Pulling October 14.		Yield per acre from 2nd Sowing 1st Pulling October 14.		Yield per acre from 1st Sowing 2nd Pulling October 28.		Yield per acre from 2nd Sowing 2nd Pulling October 28.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Champion Yellow Globe	45	1,080	28	430	47	1,370	30	1,710
2	Mammoth Yellow Intermediate	44	1,100	28	1,750	47	380	31	370
3	Yellow Intermediate	44	110	32	350	51	1,620	40	1,510
4	Giant Yellow Intermediate	43	790	30	1,380	39	870	36	270
5	Prize Winner Yellow Globe	42	1,800	34	1,630	55	550	44	440
6	Norbiton Giant	42	1,470	27	450	34	1,300	28	100
7	Half Long Sugar Rosy	42	480	27	450	40	1,180	27	120
8	Giant Yellow Half Long	42	480	34	1,300	41	170	27	780
9	Gate Post	41	830	35	290	38	230	31	40
10	Giant Yellow Globe	41	335	31	370	36	1,260	28	100
11	Half Long Sugar White	39	1,695	30	1,380	48	30	36	930
12	Mammoth Long Red	37	1,570	27	780	41	1,490	28	1,420
13	Warden Orange Globe	37	910	28	760	43	460	32	1,340
14	Golden Fleshed Tankard	36	1,590	24	675	33	330	28	100
15	Leviathan Long Red	36	1,260	30	1,380	46	1,720	42	1,800
16	Prize Mammoth Long Red	36	270	32	20	39	210	31	1,690
17	Lion Yellow Intermediate	35	1,280	31	1,360	41	1,820	36	600
18	Gate Post Yellow	34	1,960	30	60	34	970	24	840
19	Mammoth Oval Shaped	34	640	26	1,460	44	110	29	1,400
20	Selected Mammoth Long Red	34	640	28	1,420	47	710	36	270
21	Ward's Large Oval Shaped	34	310	22	1,540	37	1,240	30	1,710
22	Red Fleshed Tankard	33	1,320	26	510	34	640	26	800
23	Triumph Yellow Globe	33	990	25	490	47	1,040	37	250
24	Canadian Giant	30	225	30	60	38	1,550	32	1,670
25	Yellow Fleshed Tankard	29	1,070	24	1,830	39	210	30	1,710

	Tons.	lbs.
The average from the 1st sowing, 1st pulling was......	38	648
The average from the 2nd sowing, 1st pulling was......	29	405
The average from the 1st sowing, 2nd pulling was......	41	1,978
The average from the 2nd sowing, 2nd pulling was......	32	799

Increase in Crop from Early Sowing and Late Pulling.

The results obtained point to the advantage of early sowing. The average yield of mangels from all the varieties from the first sowing and first pulling has exceeded that of the second sowing by 9 tons 243 pounds per acre, and in the case of the second pulling made fourteen days later, the larger weight from the earlier sowing is well maintained, the difference being 9 tons 1,179 pounds per acre in favour of early sowing.

The figures given also show that the fourteen days of additional time given to the roots to grow between October 14 and 28 resulted in an average increase in weight on the early sown plots of 3 tons 1,330 pounds per acre, while those later sown increased in weight during the same period 3 tons 394 pounds per acre.

In looking through the list of varieties tested it would appear that the different strains of the Yellow Intermediate mangel are the most productive in this part of Canada, and that the strains of the Mammoth Long Red follow these closely. The Globe mangels average next best, while most of the tankard sorts range towards the bottom of the list.

SELECT LIST OF VARIETIES OF MANGELS.

In this list is given the average yield per acre obtained during the past three to six years from the more productive varieties of mangels grown at all the experimental farms, with the length of time they have been under test. Only those sorts are included which have been three years or longer under trial.

Number.	Names of Varieties.	Number of Years Under Trial.	Average Yield per acre at all the Expt. Farms.	
1	Yellow Intermediate	6	32	696
2	Giant Yellow Intermediate	6	32	254
3	Gate Post	6	31	160
4	Selected Mammoth Long Red	5	30	575
5	Mammoth Yellow Intermediate	5	29	1,841
6	Lion Yellow Intermediate	3	29	1,123
7	Giant Yellow Half Long	5	29	1,190
8	Giant Yellow Globe	6	29	686
9	Mammoth Long Red	6	29	495
10	Prize Mammoth Long Red	6	28	1,136
11	Norbiton Giant	5	28	4
12	Canadian Giant	6	27	1,861
13	Ward's Large Oval Shaped	5	27	1,020
14	Champion Yellow Globe	6	26	1,349
15	Mammoth Oval Shaped	6	26	444
16	Gate Post Yellow	4	25	1,519
17	Yellow Fleshed Tankard	3	25	841
18	Golden Fleshed Tankard	6	25	540
19	Warden Orange Globe	6	25	459
20	Red Fleshed Tankard	6	24	755

EXPERIMENTS WITH CARROTS.

Twenty varieties of carrots were under trial in 1901. These were all sown side by side adjoining the turnips and mangels; the land was similar in character and its treatment and preparation was the same. The drills were made up two feet apart, and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were made of each sort, the first on May 8, the second on May 22. They were also pulled on two different dates, the first pulling was on October 14, the second on October 28. The yield per acre has been calculated in each case from the weight of roots gathered from one row 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per acre from 1st Sowing 1st Pulling October 14.		Yield per acre from 2nd Sowing 1st Pulling October 14.		Yield per acre from 1st Sowing 2nd Pulling October 28.		Yield per acre from 2nd Sowing 2nd Pulling October 28.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Half Long White	43	790	27	1,440	42	1,140	30	390
2	New White Intermediate	42	1,140	31	1,030	38	560	32	1,670
3	Mammoth White Intermediate	40	1,510	36	1,260	44	1,760	32	1,670
4	Giant White Vosges	38	890	30	1,050	42	1,470	32	1,010
5	Iverson's Champion	37	580	29	1,400	35	1,610	39	210
6	Half Long Chantenay	37	250	23	1,190	24	1,500	28	100
7	Ontario Champion	34	1,300	34	310	32	1,010	34	1,630
8	Improved Short White	33	660	32	20	34	1,960	35	1,940
9	Green Top White Orthe	30	1,050	22	1,870	37	910	31	1,690
10	Long Yellow Stump Rooted	28	1,750	23	860	29	1,400	25	1,480
11	White Vosges Large Short	24	1,500	22	1,870	29	1,070	28	1,430
12	Yellow Intermediate	24	1,500	17	980	33	330	22	550
13	Carter's Orange Giant	24	840	21	240	31	370	28	100
14	Early Gem	23	530	21	240	27	780	23	860
15	Guerande or Ox-Heart	22	550	21	570	26	1,790	27	1,970
16	Scarlet Intermediate	21	1,560	20	590	25	820	26	140
17	White Belgian	19	610	23	530	34	1,960	28	1,420
18	Long Orange or Surrey	17	1,970	14	1,370	19	1,270	17	980
19	Long Scarlet Altringham	16	1,330	14	50	20	1,580	17	1,310
20	Scarlet Nantes	14	710	13	730	19	940	15	360

	Tons.	lbs.
The average from the 1st sowing, 1st pulling was......	28	1,651
The average from the 2nd sowing, 1st pulling was......	24	180
The average from the 1st sowing, 2nd pulling was......	31	1,212
The average from the 2nd sowing, 2nd pulling was......	27	1,946

Increase in Crop from Early Sowing and Late Pulling.

The results obtained point to the advantage of early sowing. The average yield of carrots from all the varieties from the first sowing and first pulling has exceeded that from the second sowing by 4 tons 1,471 pounds per acre, and in the case of the second pulling the larger weight from the earlier sown plots is well maintained, the difference being 3 tons 1,266 pounds per acre in favour of early sowing.

The figures given also show that the fourteen days of additional time given to the roots to grow between October 14 and 28 resulted in an average increase in weight of crop on the earlier sown plots of 2 tons 1,261 pounds per acre, while those later sown increased in weight during the same period 3 tons 1,766 pounds per acre.

In scanning the list of varieties and noting their relative position it is evident that the several strains of the White Intermediate Carrot are much the most profitable to grow here. The White Belgian has done fairly well, but it is a very difficult sort to harvest owing to its great length and cylindrical form. The short-rooted varieties of the Half Long Chantenay type have also done well.

SELECT LIST OF VARIETIES OF CARROTS.

In this list is given the average yield per acre obtained during the past three to six years from the more productive varieties of carrots, grown at all the experimental farms, with the length of time they have been under test. Only those sorts are included which have been three years or longer under trial.

Number.	Names of Varieties.	Number of Years under Trial.	Average Yield per Acre at all the Experimental Farms.	
1	New White Intermediate	3	23	1,913
2	Half Long White	6	21	1,250
3	Giant White Vosges	6	21	1,245
4	Improved Short White	6	21	637
5	Ontario Champion	4	21	450
6	Mammoth White Intermediate	6	20	1,705
7	Iverson's Champion	6	20	601
8	Green Top White Orthe	5	19	1,601
9	White Belgian	6	18	897
10	White Vosges Large Short	3	18	104
11	Yellow Intermediate	6	17	1,335
12	Early Gem	6	17	1,295
13	Half Long Chantenay	6	17	923
14	Guerande or Ox-Heart	6	17	523
15	Carter's Orange Giant	6	15	208
16	Long Orange or Surrey	6	13	1,703
17	Scarlet Intermediate	6	13	320
18	Long Scarlet Altringham	6	12	506
19	Scarlet Nantes	3	11	1,443

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of sugar beets were under trial in 1901. These were all sown side by side adjoining the carrots; the land was similar in character and its treatment and preparation was the same. The drills were made up two feet apart and rolled with a heavy land roller to make a firm bed before the seed was sown. Two sowings were

made of each sort, the first on May 8, the second on May 22. They were also pulled on two different dates. The first pulling was on October 14, the second on October 28. The yield per acre has been calculated in each case from the weight of roots gathered from one row 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety	Yield per Acre from 1st Sowing. — 1st Pulling Oct. 14.		Yield per Acre from 2nd Sowing. — 1st Pulling Oct. 14.		Yield per Acre from 1st Sowing. — 2nd Pulling Oct. 28.		Yield per Acre from 2nd Sowing. — 2nd Pulling Oct. 28.	
		Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Red Top Sugar	34	640	25	1,150	32	20	26	470
2	Royal Giant	33	660	29	1,070	33	330	26	140
3	Danish Improved	33	330	25	490	26	140	22	880
4	Danish Red Top	31	1,360	25	1,480	29	1,400	22	880
5	Improved Imperial	28	430	26	1,130	26	1,790	26	1,130
6	Wanzleben	25	160	21	1,890	25	490	18	1,950
7	Vilmorin's Improved	22	1,210	18	300	20	590	15	30

	Tons.	lbs.
The average crop from the 1st sowing, 1st pulling was..	29	1,541
The average crop from the 2nd sowing, 1st pulling was..	24	1,359
The average crop from the 1st sowing, 2nd pulling was..	27	1,251
The average crop from the 2nd sowing, 2nd pulling was..	22	1,069

Results of Early Sowing and Late Pulling.

The figures given above point to the advantage of early sowing. The average yield of sugar beets from all the varieties from the first sowing and first pulling has exceeded that from the second sowing by 5 tons 182 pounds per acre, and in the case of the second pulling made fourteen days later, precisely the same result is reached, the first sowing exceeding the second by 5 tons 182 pounds per acre.

In this case, however, the figures show no advantage from delay in pulling. On the contrary the yield from the second pulling, both sowings have given at the rate of 2 tons 290 pounds per acre less in each case than was had from the first pulling.

SELECT LIST OF VARIETIES OF SUGAR BEETS.

In this list is given the average yield per acre obtained during the past four and five years from the more productive varieties of sugar beets, grown at all the experimental farms, with the length of time they have been under test. Only those sorts are included which have been three years or longer under trial.

Names of Varieties.	Number of Years under Trial.	Average Yield per Acre at all the Experimental Farms.	
		Tons.	Lbs.
Danish Red Top	4	26	246
Red Top Sugar	5	23	172
Danish Improved	5	22	1,091
Improved Imperial	5	22	792
Wanzleben	5	21	553
Vilmorin's Improved	5	19	118

FIELD PLOTS OF POTATOES.

The following field plots of potatoes were included in the area devoted to experimental purposes. The land on which these potatoes were planted was similar throughout, and the preparation and treatment were the same for all. The soil was a sandy loam, more or less mixed with clay. The previous crop was experimental plots of wheat. After the wheat crop was cut the land was gang-ploughed shallow to start into growth any shed grain or weed seeds lying on the surface; later in the autumn it was again ploughed seven to eight inches deep. During the winter of 1900 and 1901 it received a dressing of about 12 tons of fresh barn-yard manure per acre, which was placed during the winter on the frozen ground in small piles of about a third of a cart-load each to prevent fermentation. This was spread in the spring, ploughed under about six inches deep, and harrowed with the smoothing harrow, then made into drills two and a half feet apart and six inches deep for planting. The sets were put from 12 to 15 inches apart. They were all planted May 18, and dug October 4.

FIELD PLOTS OF POTATOES, EACH ABOUT ¼ ACRE.

Number.	Name of Variety.	Yield per Acre.	
		Bush.	Lbs.
1	Early Harvest	313	30
2	Early Sunrise	303	45
3	Wonder of the World	289	8
4	Early Andes	280	48
5	Vigorosa	270	
6	Rochester Rose	262	30
7	Everett	261	
8	Carman No. 1	246	9
9	Bovee	228	36
10	Honeoye Rose	196	30

Plots 8, 9 and 10 were partly in low land, which accounts for the smaller yield.

The results of the tests of potatoes grown in experimental plots will be found in the report of the Horticulturist.

SELECT LIST OF VARIETIES OF POTATOES.

In this list is given the average yield per acre obtained during the past three to seven years from the most productive varieties grown at all the experimental farms, with the length of time they have been under test. Only those are included which have been three years or longer under trial. On this account many of the newest sorts do not appear in this list. During the past seven years a large number of varieties have been tested, and quite a number of different sorts have failed to reach that standard of productiveness required if their cultivation is to be continued. The standard for potatoes is fixed in the same way as that for oats. This will be found explained under 'Select list of oats.'

The following 29 varieties have thus been dropped from the list during the past two years. Algoma No. 1, Columbus, Crown Jewel, Charles Downing, Early Gem, Fillbasket, Freeman, Good News, Honeoye Rose, Hopeful, Harbinger, Ideal, Lightning Express, London, King of the Roses, McKenzie, Monroe County, Orphans, Pride of the Table, Peerless Junior, Queen of the Valley, Russell's Seedling, Record, Satisfaction, Seedling No. 214, Stourbridge Glory, Table King, Victor Rose, World's Fair.

Number.	Names of Varieties.	Number of Years under Trial.	Average Yield per Acre at all the Experimental Farms.	
			Bush.	Lbs.
1	Uncle Sam	4	403	35
2	Seedling No. 230	6	391	43
3	Everett	7	390	41
4	Country Gentleman	3	387	58
5	Seedling No. 7	5	386	26
6	Irish Daisy	7	384	56
7	Bovee	4	384	45
8	American Wonder	7	384	6
9	American Giant	7	383	17
10	Late Puritan	7	369	14
11	Carman No. 1	7	367	22
12	Carman No. 3	5	366	40
13	Rose No. 9	5	366	33
14	Seattle	6	364	43
15	Empire State	7	363	11
16	Burnaby Seedling	6	361	30
17	Quaker City	5	361	26
18	Penn. Manor	3	361	10
19	State of Maine	7	359	34
20	General Gordon	6	358	33
21	Holborn Abundance	7	358	28
22	Clay Rose	7	357	34
23	Northern Spy	7	356	54
24	Green Mountain	6	356	46
25	Vanier	7	355	1
26	New Variety No. 1	6	354	54
27	Cambridge Russet	4	354	5
28	Maule's Thoroughbred	4	351	3
29	Dreer's Standard	7	350	56
30	Dakota Red	7	349	14
31	Reeves' Rose	5	348	51
32	I. X. L.	7	345	40
33	Hale's Champion	6	344	36
34	Vick's Extra Early	6	344	25
35	Money Maker	7	344	12
36	Troy Seedling	7	343	38
37	Delaware	7	342	55
38	Lee's Favourite	6	342	47
39	Rochester Rose	7	341	30
40	Lizzie's Pride	7	340	56
41	Brown's Rot Proof	6	339	41
42	Polaris	7	336	..
43	Irish Cobbler	5	335	11
44	Sir Walter Raleigh	4	334	33
45	Bill Nye	5	333	49
46	Early Norther	7	332	42
47	Early Puritan	7	332	8
48	Great Divide	7	332	1
49	Early White Prize	7	330	24
50	Rural Blush	7	329	53
51	Reading Giant	6	327	52
52	Pride of the Market	7	326	17
53	Chicago Market	6	326	2
54	Pearce's Prize Winner	6	325	28
55	White Beauty	7	324	15
56	Brownell's Winner	7	323	25
57	New Queen	7	322	28
58	Early Harvest	7	319	2
59	Early Sunrise	7	317	30
60	Flemish Beauty	6	316	51
61	Maggie Murphy	7	316	1
62	Houlton Rose	5	315	28
63	Sharpe's Seedling	7	309	27
64	Earliest of All	7	307	39
65	Rural No. 2	6	306	33
66	Thorburn	7	305	7
67	Beauty of Hebron	7	304	36

Number.	Names of Varieties.	Number of Years under Trial.	Average Yield per Acre at all the Experimental Farms. Bush.	Lbs.
68	Daisy	7	303	54
69	Early Rose	7	302	8
70	Prize Taker	7	299	41
71	Early Market	3	298	19
72	Early Six Weeks	7	294	15
73	Ohio Junior	5	287	45
74	Burpee's Extra Early	7	282	59
75	Pearce's Extra Early	7	282	1
76	Early Ohio	7	273	51

EXPERIMENTS WITH SOJA BEANS.

Three plots of one-fortieth acre each were sown in rows at different distances apart, viz.: 21, 28 and 35 inches to gain information as to the best distance for sowing to secure the heaviest crops. The soil was a light sandy loam which received a dressing of barn-yard manure during the winter of 1899 and 1900 of about 12 tons per acre. The previous crop was potatoes. After the potatoes were dug, the land was ploughed late in the autmn to the depth of about seven or eight inches, and left in that condition until the following spring, when it was cultivated once with a two-horse cultivator and twice with a smoothing harrow. The beans were sown with a seed drill on May 6, and cut on September 21.

Plot 1. Sown in rows 21 inches apart; growth strong and even, leafy; average height 40 to 45 inches. The pods were well formed, but the beans were soft when the crop was cut. Total yield of green crop 14 tons 800 pounds per acre. Yield of beans, 14 bushels 40 pounds per acre.

Plot 2. Sown in rows 28 inches apart; growth strong and even, very leafy; average height 40 to 45 inches. The pods were well formed, the beans were full grown, and beginning to harden at time of cutting. Total yield of green crop, 16 tons 400 pounds per acre. Yield of beans, 16 bushels per acre.

Plot 3. Sown in rows 35 inches apart; growth very strong and even, leafy; stems hard and woody; average height 44 to 48 inches. The plants were better podded than those in plots 1 or 2, and the beans were harder when cut, but the plant was less valuable for fodder. Total yield of green crop, 15 tons 720 pounds per acre. Yield of beans, 10 bushels per acre.

EXPERIMENTS WITH HORSE BEANS.

Three plots of one-fortieth acre each were sown in rows 21, 28 and 35 inches apart, to gain information as to the best distance for sowing to secure the heaviest crop. The land was adjoining that used for soja beans, was similar in quality and received the same treatment. The previous crop was potatoes. The beans were sown with the seed drill; all the plots were sown on May 6, and cut on September 21.

Plot 1. Sown in rows 21 inches apart; growth strong, moderately well podded; height 47 to 50 inches, plot all standing. The beans were nearly ripe when cut. Total yield, 8 tons 1,280 pounds per acre. Yield of beans, 22 bushels 40 pounds per acre.

Plot 2. Sown in rows 28 inches apart; growth strong and well podded; height 49 to 53 inches. Plot all standing, stalks considerably stiffer than in plot No. 1. The beans were nearly ripe when cut. Total yield, 9 tons 1,600 pounds per acre. Yield of beans, 26 bushels 40 pounds per acre.

Plot 3. Sown in rows 35 inches apart; growth strong, well podded; height 49 to 53 inches. Plot all standing, stalks stiff. The beans were nearly ripe when cut. Total yield, 8 tons 400 pounds per acre. Yield of beans, 20 bushels 6 pounds per acre.

EXPERIMENTS WITH MILLETS.

Nine varieties of millet were sown on plots of one-fortieth acre each in drills seven inches apart. The soil was a light sandy loam. The previous crop was potatoes. The land receiving a dressing of barn-yard manure during the winter of 1899 and 1900 of about 12 tons per acre. After the potatoes were dug the land was ploughed to the depth of seven or eight inches, and left in that condition till the following spring, when it was cultivated once with a two-horse cultivator and twice with a smoothing harrow before sowing. The seed was sown with a Planet Junior seed drill, and all the varieties were sown on May 6. These were all cut when the seed was in the doughy stage. The two varieties under numbers were received for trial from the United States Department of Agriculture, Washington.

MILLETS—TEST OF VARIETIES.

Number.	Name of Variety.	Date Cut.	Length of Straw.	Character of Growth.	Weight per Acre, Green.		Weight per Acre, Dry.	
			Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Cat-tail	Sept. 23.	60—65	Strong.	17	1040	8	1280
2	Pearl	Aug. 27.	32—38	"	16	1920	8	1280
3	White Round Extra French	July 27.	63—65	"	11	1040	5	1520
4	Moha Hungarian	" 27.	48—50	"	10	1760	5	240
5	Japanese	Aug. 27.	53—55	"	9	560	4	640
6	German or Golden	" 27.	48—50	"	8	1920	4	1920
7	Italian or Indian	" 27.	43—46	Medium.	7	1680	3	1360
8	No. 5647 (Dept. Agr., Wash., U.S.A.)	" 12.	34—36	"	6	800	3	720
9	No. 5648 (" " ")	" 12.	34—36	"	6	480	3	400

EXPERIMENTS WITH MIXED ROOTS AND WITH MIXED ROOTS AND VEGETABLES.

Four plots were sown with mixtures of field roots, and one with carrots, cabbages and tomatoes to see how far a farmer could thus supply himself with such material for his own use at very little cost and labour.

Four rows were sown in each case about 100 feet long and two feet apart, the seed was sown about the usual thickness and the plants subsequently thinned. About equal parts by weight of seed was used in all the plots, excepting No. 5, where it was used in about equal proportions by measure. Any undue proportion of young plants of any sort can be regulated when the thinning is done. They were all sown May 8, and the roots were pulled October 30. The vegetables were gathered about the middle of September.

Mixed Roots and Roots and Vegetables.			Yield per Acre.	
			Tons.	Lbs.
Plot 1—Mangels, carrots and turnips			40	1,840
" 2—Mangels and turnips			39	1,200
" 3—Mangels and carrots			39	870
" 4—Carrots and turnips			38	230
Carrots, Cabbages and Tomatoes.	Tons.	Lbs.		
5 Yield per acre of Cabbage	18	960		
" " Carrots	7	520		
" " Tomatoes	8	1,820	34	1,300

Although sown out of doors and having no advantage in the way of hot-bed cultivation, the tomatoes grew well and ripened a large crop, the cabbage also which was an early variety formed fine heads. All cultivation was by horse cultivator until the plants got too large to admit of this. The expense, both for seed and labour was very trifling. The yield per acre has been calculated in each case from the weight of one row 66 feet long.

INFLUENCE OF PREVIOUS CROPS ON GROWING GRAIN.

In the annual report for 1900, some experiments were reported on in the growing of oats after other crops to gain information regarding the influence of previous crops on subsequent growth, and how long this influence is apparent. Six plots were then referred to where Sensation oats were grown after flax, grain, horse beans, soja beans, Indian corn and millet, and particulars regarding the oat crop given. This year the test has included four plots only, the Indian corn and millet plots having been omitted. Barley was sown instead of oats, the variety chosen being the Mensury, which was sown at the rate of $1\frac{3}{4}$ bushels per acre. The soil in this instance was a sandy loam which had received no manure since 1897, when an application was made of about 12 tons per acre. The land was ploughed late in the autumn of 1900 to a depth of 7 or 8 inches, and in the spring of 1901 it was cultivated twice with the two-horse cultivator, and well harrowed before sowing.

Sown in 1899.	In 1900.				In 1901.			
	Sensation oats Yield per Acre.		Length of Straw.	Length of Head.	Mensury barley Yield per Acre.		Length of Straw.	Length of Head.
	Bush.	Lbs.	Inches.	Inches.	Bush.	Lbs.	Inches.	Inches.
Plot 1—Flax	49	14	40—45	8 — $9\frac{1}{2}$	35	—	37—39	3—$3\frac{1}{2}$
" 2—Grain	58	28	43—48	$8\frac{1}{2}$— $9\frac{1}{2}$	39	8	36—38	3—$3\frac{1}{2}$
" 3—Horse beans	69	14	46—50	9 —10	40	—	38—40	3—4
" 4—Soja beans	49	14	40—45	$8\frac{1}{2}$— $9\frac{1}{2}$	31	32	33—35	3—$3\frac{1}{2}$

EFFECTS OF THE PLOUGHING UNDER OF GREEN CLOVER AS A FERTILIZER FOR OATS.

In the spring of 1900, six plots of one-eightieth of an acre each were sown with grain. Two of these plots were sown with Preston wheat, two with Mensury barley,

and two with Banner oats. One plot in each case had common red clover sown with the grain at the rate of 12 pounds per acre, the other had no clover. The soil was a light sandy loam of fairly good quality, which had received no manure or other fertilizer since 1897, when it had an application of about 12 tons per acre.

After the grain was harvested in 1900, the clover on the alternate plots made good growth, and when the time arrived for ploughing it under it had made a good mat of foliage. This was turned under about the middle of October, and in the spring of 1901 it was cultivated twice with the two-horse cultivator, and harrowed before sowing. The Banner oats were sown on May 4, and cut August 5.

Variety.	Length of Straw.	Length of Head.	Yield of Oats per acre.	Weight of Straw per acre.
Banner oats sown after,	Inches.	Inches.	Bus. Lbs	Lbs.
Wheat Preston, 1900, no clover	42—44	8—9	47 2	2,480
Wheat Preston, 1900, with clover	47—49	8—9½	49 14	3,440
Barley Mensury, 1900, no clover	40—42	8—9	37 22	1,920
Barley Mensury, 1900, with clover	47—49	8—9½	42 12	2,640
Oats Banner, 1900, no clover	37—39	8—9	35 10	2,240
Oats Banner, 1900, with clover	46—48	8—9½	40 --	3,040

The average gain in those plots where clover was grown was, in grain 3 bushels 31 pounds per acre, and in straw 827 pounds per acre, an increase of nearly 10 per cent in the grain, and over 35 per cent in the straw.

EFFECTS OF THE PLOUGHING UNDER OF GREEN CLOVER AS A FERTILIZER FOR INDIAN CORN.

In the spring of 1900, six plots of one-eightieth of an acre each were sown with grain. Two were sown with Preston wheat, two with Mensury barley, and two with Banner oats. One plot in each case had common red clover sown with the grain at the rate of 12 pounds per acre, the other had no clover. These plots were adjoining those of a similar test of oats, and the soil was of the same character and had received the same preparatory treatment. After the grain was harvested in 1900, the clover was allowed to grow until the following season, and was ploughed under about the middle of May, by which time it had made a very heavy growth. The variety of corn chosen for these tests was the Selected Leaming, which was sown on May 23, in rows 3 feet apart, and cut September 18. The results are given in the appended table.

Variety.	Height.	Leafiness.	Condition when cut.	Weight of green fodder per Acre.
Selected Leaming grown after,	Inches.			Tons. Lbs.
Wheat Preston, no clover	85— 90	Medium	Late milk.	19 1,280
Wheat Preston, with clover	92—106	Very leafy	"	27 1,760
Barley Mensury, no clover	85— 90	Medium	"	15 1,600
Barley Mensury, with clover	92—106	Very leafy	"	27 830
Oats Banner, no clover	85— 90	Medium	"	20 160
Oats Banner, with clover	92—106	Very leafy	"	25 1,600

The average gain in green fodder on the plots where clover was grown, was 8 tons 1,066 pounds per acre, an increase of over 40 per cent.

EFFECTS OF THE PLOUGHING UNDER OF GREEN CLOVER AS A FERTILIZER FOR POTATOES.

In the spring of 1900, six plots of one-eightieth of an acre each were sown with grain. Two were sown with Preston wheat, two with Mensury barley, and two with Banner oats. One plot in each case had common red clover sown with the grain at the rate of 12 pounds per acre, the other had no clover. These plots were adjoining those of a similar test with oats and Indian corn, and the soil was of the same character and had received the same preparation. After the grain was harvested in 1900, the clover was allowed to grow until the following season, and was ploughed under about the middle of May, by which time it had made a very heavy growth. The variety of potato chosen for this test was the Everett, which was planted on May 23, in rows 3 feet apart, and dug October 4. The results were as follows:—

Variety Everett.	Yield per acre.	
Everett potato planted after,	Bush.	Lbs.
Preston wheat, no clover	396	40
Preston wheat, with clover	440	
Mensury barley, no clover	396	
Mensury barley, with clover	420	
Banner oats, no clover	381	20
Banner oats, with clover	411	20

The average gain of potatoes on the plots where the clover was grown, was 32 bushels 27 pounds per acre, being an increase of over 8 per cent.

EFFECTS OF FERTILIZERS ON SPRING WHEAT, OATS, CLOVER AND BROME GRASS.

During the season of 1900, two series consisting in each case of sixteen one-eightieth acre plots were laid out, twelve of which in each set were treated with different fertilizers, and the remaining four left as check plots which received no fertilizers.

One set of these plots was sown with spring wheat of the variety known as Preston, another with a variety of oats known as Improved Ligowo. Two other series each consisting of nine plots were planned, one to be used for experiments with common red clover, and the other for the Awnless Brome grass *Bromus inermis*.

The object in view in these tests is to gain information as to the effects on crops sown on land in a fair average condition of fertility, of superphosphate of lime and Thomas' phosphate, both used singly, also of superphosphate of lime with kainit and with kainit and nitrate of soda, and of Thomas phosphate with kainit, and with kainit and nitrate of soda. In the series of plots planned for wheat and oats, provision was also made for testing the relative value of barn-yard manure fresh and rotted, fresh slaked lime and nitrate of soda alone in the proportions of 100 and 200 pounds per acre with a check plot between them. In 1900 all these were reported on, but this year through a misunderstanding the last five plots in each of these series were not sown, hence returns can only be given for nine plots in each case.

The land chosen for this test was in a fairly good condition of tilth. The soil was a sandy loam which has been under cultivation since 1887, and has been cropped each year since, with a suitable rotation of crops and has received a dressing of barn-yard manure about once in four years. The last application of manure was in 1897 when it received about 12 tons per acre. The land was cropped in 1899 with experimental grain in plots mostly barley.

It is proposed to grow the same crops on this land for a series of years, using the same fertilizer in the same quantities every second year. In this way it is hoped that some further information may be gained as to the effect of these different fertilizers when used singly and in combination on the important crops named. As this land was at the start in a fair average condition as to fertility, it may be regarded as representing in a general way average sandy loams on farms properly worked. The fertilizers were applied in the spring of 1900, but none were used in 1901. The spring wheat and oats were both sown on May 4, and both were ripe on August 5.

RESULTS OF THE APPLICATION OF FERTILIZERS TO SPRING WHEAT.

No. of Plot.	Name of Variety, Preston.	Season of 1900.		Season of 1901.		
		Yield of grain per acre.		Yield of grain per acre.		Weight of straw per acre.
	Fertilizers used.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	25	20	26	40	2,800
2	Thomas' phosphate, 400 lbs. per acre	25	20	30	40	2,240
3	Thomas' phosphate, 800 lbs. per acre	25	20	28	—	2,480
4	Check	26	40	26	40	2,400
5	Thomas' phosphate, 400 lbs., kainit, 200 lbs. per acre	26	40	24	—	2,000
6	Superphosphate, 400 lbs., kainit, 200 lbs. per acre	24	40	24	—	2,000
7	Check	25	20	27	20	1,960
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	26	—	26	40	2,240
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	26	—	24	40	2,120

RESULTS OF THE APPLICATION OF FERTILIZERS TO OATS.

No. of Plot.	Name of Variety, Improved Ligowo.	Season of 1900.		Season of 1901		
		Yield of grain per acre.		Yield of grain per acre.		Weight of straw per acre.
	Fertilizers used.	Bush.	Lbs.	Bush.	Lbs.	Lbs.
1	Superphosphate, 400 lbs. per acre	70	20	47	20	3000
2	Thomas' phosphate, 400 lbs. per acre	72	22	51	26	3280
3	Thomas' phosphate, 800 lbs. per acre	72	22	45	30	2920
4	Check	75	10	42	12	2400
5	Thomas's phosphate, 400 lbs. kainit, 200 lbs. per acre	70	20	40	—	2240
6	Superphosphate, 400 lbs., kainit, 200 lbs. per acre	73	18	40	—	2560
7	Check	73	18	42	12	2800
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	70	20	49	14	3200
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	68	8	51	26	3680

In both these series of tests the two check plots to which no fertilizers have been applied have given crops of grain averaging as large as those on which fertilizers have been used. The crops of straw, however, average heavier on the plots which were fertilized. This would seem to indicate that the land still contains as much available plant food as the crops could utilize for grain production under the conditions prevailing during these two seasons. With the partial exhaustion which successive crops will produce, the relative usefulness of the several fertilizers will probably be more clearly shown.

On the plots used for the tests of common red clover the seed was sown in the spring of 1900, in the proportion of 12 pounds per acre, and on the plots for brome grass the seed was also sown in the spring of 1900, in the proportion of 20 pounds per acre. The growth, both of clover and brome grass, was strong on all these plots.

RESULTS OF THE APPLICATION OF FERTILIZERS TO CLOVER.

No. of plot	Fertilizers used.	Length of clover. 1st cutting	Length of clover. 2nd cutti'g	Yield per acre green 1st cutting.		Yield per acre cured 1st cutting.		Yield per acre green 2nd cutting.		Yield per acre cured 2nd cutting.	
		Inches.	Inches.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.
1	Superphosphate, 400 lbs. per acre	34—36	18—20	14		3	1,080	4	1,520	1	640
2	Thomas' phosphate, 400 lbs. per acre	32—34	17—19	14	1,440	3	1,920	7	400	1	1,480
3	Thomas' phosphate, 800 lbs. per acre	36—40	17—19	13	1,680	3	1,440	7		1	1,280
4	Check	32—34	19—21	13	720	3	960	6	240	1	1,260
5	Thomas' phosphate, 400 lbs. kainit, 200 lbs per acre	32—34	19—21	13	1,840	3	1,040	5	1,920	1	1,200
6	Superphosphate, 400 lbs. kainit, 200 lbs. per acre	36—38	19—21	13	1,280	3	1,040	3	1,040	1	240
7	Check	32—34	19—21	12	1,600	3	1,200	4	1,840	1	1,200
8	Thomas' phosphate, 400 lbs. kainit, 200 lbs. nitrate soda 100 lbs. per acre	38—40	16—18	13	160	3	1,120	2	1,440		1,600
9	Superphosphate, 400 lbs. kainit, 200 lbs. nitrate soda, 100 lbs. per acre	34—36	18—20	12	960	3	1,040	1	1,840		1,120

RESULTS OF THE APPLICATION OF FERTILIZERS TO AWNLESS BROME GRASS.

(Bromus inermis.)

No. of plot	Awnless Brome Grass (Bromus inermis).	Length of Brome Grass.	Yield per acre green.		Yield per acre cured.	
	Fertilizers used.	Inches.	Tons.	Lbs.	Tons.	Lbs.
1	Superphosphate, 400 lbs. per acre	48—52	7		4	640
2	Thomas' phosphate, 400 lbs. per acre	48—50	6	1,840	3	1,600
3	Thomas' phosphate, 800 lbs. per acre	46—48	5	480	2	1.600
4	Check	44—46	4	800	1	1,920
5	Thomas' phosphate, 400 lbs. kainit, 200 lbs. per acre	46—48	5	240	2	800
6	Superphosphate, 400 lbs., kainit, 200 lbs. per acre	46—48	4	1,120	2	80
7	Check	47—50	4	1,920	2	320
8	Thomas' phosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	47—50	7	560	3	800
9	Superphosphate, 400 lbs., kainit, 200 lbs., nitrate soda, 100 lbs. per acre	42—44	5	1,440	2	520

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the annual report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which were carried on during the previous five or six years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combination of fertilizers on the more important farm crops. The particulars there given covered the results of six years' experience with crops of wheat and Indian corn and five years' experience with

crops of oats, barley, turnips and mangels. The results of similar tests conducted for three years with carrots and one year with sugar beets were also given.

These experiments have been continued; and as explanatory regarding the preparations made and the general plan together with the way in which they have been carried on, the following paragraphs are quoted from the report of 1893:—

'A piece of sandy loam more or less mixed with clay, which was originally covered with heavy timber, chiefly white pine, was chosen for these tests. The timber was cut many years ago, and among the stumps still remaining when the land was purchased, there had sprung up a thick second growth of trees, chiefly poplar, birch and maple, few of which exceeded 6 inches in diameter at the base. Early in 1887, this land was cleared by rooting up the young trees and stumps and burning them in piles, on the ground from which they were taken, the ashes being afterwards distributed over the soil as evenly as possible, and the land ploughed and thoroughly harrowed. Later in the season it was again ploughed and harrowed, and most of it got into fair condition for cropping.

'The plots laid out for the experimental work with fertilizers were one-tenth of an acre each, 21 of which were devoted to experiments with wheat, 21 to barley, 21 to oats, 21 to Indian corn or maize, and 21 to experiments with turnips and mangels. It was not practicable to undertake work on all the plots the first season. The tests were begun in 1888 with 20 plots of wheat and 16 of Indian corn, and in 1889 all the series were completed excepting six plots of roots, Nos. 16 to 21 inclusive, which were available for the work in 1890.' In all cases the plots in each series have been sown on the same day.

'In 1890 it was found that all the grain plots had become so weedy that the growth of the crops was much interfered with, and with the view of cleaning the land, one-half of each of the wheat and oat plots was sown with carrots in 1891, and one-half of each of the barley plots with sugar beets. In 1892 the other half of each plot in each of these series was sown with carrots. In 1893 it was thought desirable to continue this cleaning process, and carrots were again sown on the half of the wheat and oat plots occupied with this crop in 1891, and also the half of the barley plots cropped with sugar beets that year.' In 1894, 1895, 1896, 1897 and 1898 the one-half of the oat plots were sown again with carrots and the half of the plots devoted to wheat and barley were planted with potatoes.

TREATMENT OF SOIL.

'The treatment of the soil on all the grain plots has been to gang-plough soon after harvest, and after the shed grain and weeds have well started to plough again later, about 7 inches deep. In spring the plots have been gang-ploughed once before applying the fertilizers, which are then scattered over the surface and harrowed with the smoothing harrow before sowing. On those plots where barn-yard manure has been used, the manure has been lightly ploughed under as soon as possible after it has been spread on the land and just before sowing. Wherever barn-yard manure is spoken of, it is understood to be a mixture of horse and cow manure in about equal proportions.'

A summary of these permanent fertilizer plots is given each year, taking the average yield of the whole previous period, adding the results of the current year, and then giving the average yield for the full time.

OBJECTS IN VIEW IN CONDUCTING THESE EXPERIMENTS.

It should be distinctly understood that in establishing and conducting this series of experiments, the object in view has been to gain as much information as possible as to the actual effects of certain fertilizers and combinations of fertilizers on particular crops. These experiments were never intended to serve as model test plots such

as farmers could copy to advantage in their general practice. On the contrary, to gain the information desired, it has been found necessary to use some fertilizers in extravagant quantities, and in other instances to more or less exhaust the soil by a succession of crops of the same sort, practices which in ordinary farming would be detrimental. Nevertheless, much useful information has been acquired, some of a positive and some of a negative character, by this long-conducted and extensive series of tests. The information now gained from year to year throws light in many ways on the action of fertilizers and is increasingly useful.

VALUABLE INFORMATION GAINED.

As results of these trials, it has been shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

At the time when these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is of no value as a fertilizer.

The use of sulphate of iron, which at the time these tests were begun, was highly recommended by an authority at that time eminent, as a reliable means of producing increased crops, has also been proven to be almost useless for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a most valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proven to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and in No. 8 also, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate was used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on those plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The clover seed germinated well, and after the grain was cut the young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under. The growing of carrots and potatoes on one half of the cereal plots has been discon-

tinued since 1898, and each plot of the wheat, barley and oats has occupied the full tenth of an acre.

In 1900 and 1901 clover was again sown on all the grain plots, which produced a good growth during the season and was ploughed under in October.

APPLICATION OF FERTILIZERS DISCONTINUED.

Another direction in which information was sought was in reference to the length of time which a liberal application of barn-yard manure would continue to affect subsequent crops, and in 1899 on plots 1, 2 and 6 the barn-yard manure, which had been used for ten or eleven years in succession, was discontinued. The phosphate fertilizer was also omitted on plot 6 in each series.

In 1900 all the fertilizers on all the plots were discontinued, and it is proposed to continue to grow the same crops on all these plots from year to year without fertilizers for some years, sowing clover with the grain each season. In this way it is expected that much information will be gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which have been used on these plots since the experiments were begun.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover to advantage on the Indian corn and root plots, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their place in the proportion of 12 pounds per acre, and no fertilizers were applied. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil, and was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn about the middle of that month. Then roots and Indian corn were again sown. This course will be continued for some years, growing Indian corn and roots every second year, and common red clover the alternate season. No fertilizers were applied in 1900 or 1901, and it is proposed to discontinue their use entirely for some years, so that the effect on these crops of the ploughing under of clover every second year may be carefully studied under the varying conditions presented by these more or less exhausted plots.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of 1½ bushels per acre, excepting in 1894; and the varieties used were as follows:—In 1888-89-90 and 1891, White Russian, and in 1892-3, Campbell's White Chaff. In 1894, the Rio Grande wheat was used, when, owing to lack of germinating power in the seed, a larger quantity was required. In 1895, 1896, 1897, 1898, 1899, 1900 and 1901 Red Fife wheat was used in the usual quantity of 1½ bushels per acre. In 1901, the Red Fife was sown April 30, came up May 8, and was ripe from August 10 to 12.

The season of 1901 has not been specially favourable for the growing of spring wheat at Ottawa, and the fact that all the plots have increased in yield notwithstanding that the fertilizers have been all discontinued for the past two years seems to show that the ploughing under of the green clover is having a beneficial effect. This influence is very evident on the check plots which have been unmanured from the beginning where the increase both in grain and straw is remarkable.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Thirteen Years. Yield of Grain. Per acre. Bush.	Average Yield for Thirteen Years. Yield of Grain. Per acre. lbs.	Average Yield for Thirteen Years. Yield of Straw. Per acre. Lbs.	14th Season, 1901, Variety Red Fife. Yield of Grain. Per acre. Bush.	14th Season, 1901, Variety Red Fife. Yield of Grain. Per acre. lbs.	14th Season, 1901, Variety Red Fife. Yield of Straw. Per acre. Lbs.	Average Yield for Fourteen Years. Yield of Grain. Per acre. Bush.	Average Yield for Fourteen Years. Yield of Grain. Per acre. lbs.	Average Yield for Fourteen Years. Yield of Straw. Per acre. Lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then....	21	$26\frac{7}{13}$	3,965	26	50	5,370	21	$49\frac{9}{14}$	4,065
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure has been applied since then....	22	$4\frac{4}{13}$	4,007	28	45	5,295	22	$14\frac{13}{14}$	4,099
3	Unmanured from the beginning....	10	$33\frac{11}{13}$	1,873	17	20	2,370	11	$2\frac{12}{14}$	1,908
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' Phosphate was used. No fertilizers have been applied since then....	10	45	2,027	18	15	2,785	11	$17\frac{2}{14}$	2,081
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then....	12	$33\frac{11}{13}$	2,855	13	15	2,825	12	$36\frac{11}{14}$	2,853
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons' per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898 500 lbs. of Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	18	$46\frac{10}{13}$	3,300	23	20	4,575	19	$6\frac{4}{14}$	3,371
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then....	12	$46\frac{8}{13}$	2,510	16	50	3,885	13	4	2,608
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then....	10	$49\frac{6}{13}$	2,078	14	35	3,145	11	$5\frac{8}{14}$	2,154
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then....	11	$37\frac{12}{13}$	1,890	15	50	2,420	11	$55\frac{13}{14}$	1,928
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then...	12	$53\frac{6}{13}$	3,029	14	40	2,745	13	$1\frac{1}{14}$	3,009

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT $\frac{1}{10}$TH ACRE EACH—*Continued.*

No. of Plot.	Fertilizers applied each Year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Thirteen Years.			14th Season, 1901. Variety, Red Fife.			Average Yield for Fourteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
11	Mineral superphosphate, No. 1. 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizers have been applied since then	14	$16\frac{2}{13}$	2,821	16	5	3,750	14	$23\frac{13}{14}$	2,887
12	Unmanured from the beginning	9	$47\frac{4}{13}$	1,8[illegible]0	15	5	3,235	10	10	1,931
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$1\frac{5}{13}$	1,965	16	5	2,750	12	$18\frac{11}{14}$	2,021
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	15	$7\frac{9}{13}$	2,474	15	—	3,860	15	$7\frac{2}{14}$	2,573
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	$33\frac{1}{13}$	2,360	17	10	2,850	13	$48\frac{8}{14}$	2,395
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then.	15	21	2,134	17	30	2,870	15	$30\frac{3}{14}$	2,187
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	24	2,343	15	50	2,720	12	$38\frac{10}{14}$	2,370
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$27\frac{9}{13}$	1,874	14	20	2,690	12	$35\frac{10}{14}$	1,932
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	13	$25\frac{5}{13}$	1,523	16	—	2,035	13	36	1,560
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	12	$26\frac{7}{13}$	1,890	14	50	2,135	12	37	1,908
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been used since then	12	$42\frac{12}{13}$	1,882	18	—	2,195	13	6	1,904

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was 2 bushels in 1889, 1890 and 1891, $1\frac{1}{2}$ bushels in 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897, 1898, 1899, 1900 and 1901. Two-rowed barley has been used for seed throughout the whole period. The varieties used were as follows: 1889, 1890 and 1891, Saale; 1892, Goldthorpe; 1893, Duck-bill; and in 1894, 1895, 1896, 1897, 1898, 1899, 1900 and 1901, Cana-

dian Thorpe, a selected form of the Duck-bill. In 1901 the Canadian Thorpe was sown on April 29, came up May 8, and was harvested from July 25 to 30.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Twelve Years.			13th Season, 1901. Variety, Canadian Thorpe.			Average Yield for Thirteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure has been applied since then	34	$42\frac{4}{12}$	3,019	29	28	3,045	34	$23\frac{7}{13}$	3,021
2	Barn-yard manure, fresh, 15 tons per acre, each year to 1898, inclusive. No manure has been applied since then	35	$12\frac{2}{12}$	3,198	28	26	3,155	34	$35\frac{5}{13}$	3,195
3	Unmanured from the beginning	13	$5\frac{2}{12}$	1,512	10	15	1,120	12	$42\frac{11}{13}$	1,482
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used, no fertilizers have been applied since then	14	$7\frac{5}{12}$	1,430	14	13	1,635	14	$7\frac{11}{13}$	1,446
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	20	$13\frac{1}{12}$	2,235	21	12	1,850	20	$16\frac{9}{13}$	2,205
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	27	$38\frac{9}{12}$	2,377	22	34	2,605	27	$19\frac{12}{13}$	2,394
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then......................	24	$21\frac{2}{12}$	2,402	27	24	1,785	24	$32\frac{6}{13}$	2,355
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.....	19	$31\frac{9}{12}$	1,712	18	46	1,915	19	$29\frac{2}{13}$	1,729
9	Mineral superphosphate, No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then	20	$26\frac{3}{12}$	1,807	14	33	1,105	20	$4\frac{8}{13}$	1,753
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	28	$13\frac{6}{12}$	2,357	18	1	2,755	27	$23\frac{8}{13}$	2,388

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY, $\frac{1}{10}$TH ACRE EACH.

No. of plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Twelve Years. Yield of Grain. Per acre.		Average Yield for Twelve Years. Yield of Straw. Per acre	13th Season, 1901. Variety, Canadian Thorpe. Yield of Grain. Per acre.		13th Season, 1901. Variety, Canadian Thorpe. Yield of Straw. Per acre	Average Yield for Thirteen Years. Yield of Grain. Per acre.		Average Yield for Thirteen Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	26	$10\frac{4}{12}$	2,506	19	8	2,220	25	$32\frac{4}{13}$	2,484
12	Unmanured from the beginning..........	12	$43\frac{7}{12}$	1,215	10	10	1,495	12	$33\frac{8}{13}$	1,237
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	13	$43\frac{1}{12}$	1,419	12	19	1,565	13	$37\frac{7}{13}$	1,430
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	22	$32\frac{4}{12}$	2,040	21	2	2,180	22	$26\frac{4}{13}$	2,051
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	21	$42\frac{5}{12}$	2,329	18	1	2,400	21	$28\frac{2}{13}$	2,334
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	22	$6\frac{1}{12}$	1,827	20	30	2,035	22	$\frac{7}{13}$	1,843
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	18	$31\frac{10}{12}$	1,933	16	7	2,135	18	$22\frac{7}{13}$	1,949
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	17	$44\frac{10}{12}$	1,692	13	46	1,540	17	$30\frac{2}{13}$	1,680
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then	27	$26\frac{11}{12}$	2,016	21	22	1,810	27	$4\frac{5}{13}$	1,846
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then....	19	$28\frac{10}{12}$	1,605	19	13	1,300	19	$27\frac{8}{13}$	1,582
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then............................	20	$8\frac{4}{12}$	1,794	17	19	1,175	19	$46\frac{1}{13}$	1,746

OAT PLOTS.

The quantity of seed sown per acre on the oat plots, was 2 bushels in 1889 and 1890; 1½ bushels in 1891, 1892 and 1893, and 2 bushels in 1894, 1895, 1896, 1897, 1898, 1899, 1900 and 1901. The varieties used were as follows: In 1889, Early English; in 1890, 1891, 1892, 1893, Prize Cluster; and in 1894, 1895, 1896, 1897, 1898, 1899, 1900 and 1901, Banner. In 1901 the Banner was sown April 30, came up May 8, and the plots were harvested from August 1 to 5.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$ ACRE EACH.

Number of Plot.	Fertilizers applied each Year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Twelve Years.			13th Season, 1901. Variety, Banner.			Average Yield for Thirteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898 inclusive. No manure has been applied since then......	50	$26\frac{3}{12}$	3,168	52	22	3,790	50	$31\frac{2}{13}$	3,216
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898 inclusive. No manure has been applied since then...	55	$18\frac{9}{12}$	3,372	53	18	3,805	55	$13\frac{6}{13}$	3,405
3	Unmanured from the beginning...........	31	$33\frac{1}{12}$	1,523	48	3	2,635	33	$7\frac{3}{13}$	1,609
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizers have been applied since then..................	31	$22\frac{7}{12}$	1,688	48	28	2,660	32	$33\frac{6}{13}$	1,763
5	Mineral phosphate, untreated, finely ground, 500 lbs. nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then...........	48	$32\frac{2}{12}$	2,679	51	31	2,600	49	$5\frac{3}{13}$	2,673
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then	47	$7\frac{10}{12}$	2,615	53	23	3,570	47	$24\frac{9}{13}$	2,688
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then...........	47	$29\frac{9}{12}$	3,150	56	31	3,415	48	$19\frac{5}{13}$	3,170
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then......	41	6	2,371	54	24	3,170	42	$7\frac{5}{13}$	2,432
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been used since then	36	$14\frac{9}{12}$	1,930	42	2	2,155	36	$29\frac{6}{13}$	1,947
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47	$7\frac{5}{12}$	2,731	45	25	2,595	47	$3\frac{7}{13}$	2,721
11	Mineral superphosphate, No. 1, 350 lbs. nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. No fertilizers have been applied since then...	36	$31\frac{7}{12}$	2,414	49	29	27 55	37	$31\frac{5}{13}$	2,410

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS, $\frac{1}{10}$ ACRE EACH—*Continued.*

Number of Plot.	Fertilizers applied each Year, from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1899 and each year since with the grain and ploughed under in the Autumn.	Average Yield for Twelve Years.		13th Season, 1901. Variety. Banner.		Average Yield for Thirteen Years.	
		Yield of Grain.	Yield of Straw.	Yield of Grain.	Yield of Straw.	Yield of Grain.	Yield of Straw.
		Per acre.	Per acre	Per acre.	Per acre	Per acre.	Per acre
		Bush. lbs.	Lbs.	Bush. lbs.	Lbs.	Bush. lbs.	Lbs.
12	Unmanured from the beginning..........	21 25$\frac{7}{12}$	1,455	30 15	12 70	22 14$\frac{4}{13}$	1,431
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.	34 13$\frac{7}{12}$	1,988	34 14	25 85	34 13$\frac{8}{13}$	2,034
14	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	39 28$\frac{7}{12}$	2,203	49 14	27 00	40 19$\frac{5}{13}$	2,241
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	47 25$\frac{4}{12}$	2,686	46 16	33 40	47 22	2,736
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then.	36 14$\frac{4}{12}$	2,117	52 32	27 00	37 23$\frac{7}{13}$	2,162
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1849, inclusive. No fertilizers have been applied since then.	44 11$\frac{1}{12}$	2,906	50 20	23 00	44 27$\frac{6}{13}$	2,859
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..	36 6$\frac{6}{12}$	2,044	48 28	17 70	37 5$\frac{7}{13}$	2,023
19	Common salt (Sodium chloride) 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then..............................	35 28$\frac{9}{12}$	1,923	47 32	21 60	36 26$\frac{5}{13}$	1,941
20	Land plaster or gypsum (Calcium sulphate) 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers have been applied since then	33 9$\frac{3}{12}$	1,968	41 6	18 20	33 29$\frac{12}{13}$	1,957
12	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then...........................	34 17$\frac{9}{12}$	1,828	40 20	21 60	34 33$\frac{8}{13}$	1,854

INDIAN CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be as far as is practicable in the late milk, or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the Dent varieties was tested under No. 1. The Mammoth Southern Sweet was tried in 1888, 1889 and 1890. In 1891 the Red Cob Ensilage was used, and in 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899 and 1901 a free growing Flint variety, the Rural Thoroughbred White Flint, was tested. On the other half of the plot (No. 2) the Canada Yellow Flint was used in 1888, 1889 and 1890, the Thoroughbred White Flint in 1891, Pearce's Prolific in 1892, 1893 and 1894, and the Mammoth Eight Rowed Flint in 1895, 1896, 1897, 1898, 1899 and 1901. For the first four years the No. 1 series was planted in drills 3 feet apart,

using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches, and the No. 2 in hills 3 feet apart each way and 4 or 5 kernels in a hill. During the past seven years both sorts have been grown in hills.

In 1900 no crop of Indian corn was grown on these plots, but clover was sown in their place on May 5 in the proportion of twelve pounds per acre. This made a strong growth was cut twice during the season and left on the ground to decay so that when ploughed under the land might get the full benefit of the clover crop. The clover was allowed to remain growing until May 20, 1901, by which time it had made a very heavy growth. It was then ploughed under about six inches deep, and harrowed well before the corn was planted. The corn in both series of plots was planted in 1901, on May 25, and cut for ensilage on September 12.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, $\frac{1}{10}$TH ACRE EACH, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted.	Average Yield for Twelve Years.				13th Season, 1901.				Average Yield for Thirteen Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thoroughb'd White Flint weight of green fodder		½ Plot No. 2—Mam. 8 rowed, weight of green fodder		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons	lbs.	Tons	lbs	Tons	lbs.	Tons	lbs	Tons	lbs.	Tons	lbs
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre, each year from 1888 to 1898 inclusive. No manure has been applied since then..	15	1,233	12	131	23	1,810	21	200	16	508	12	1,521
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre each year from 1888 to 1898 inclusive. No manure has been applied since then............	16	1,323	10	1,809	17	100	17	1,480	16	1,383	11	860
3	Unmanured from the beginning..........	7	323	5	410	9	520	6	1,810	7	646	5	672
4	Mineral phosphate, untreated, finely ground, 800 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' Phosphate was used. No fertilizers have been applied since then........................	6	1,840	4	305	18	1,600	15	1,320	7	1,668	5	75
5	Mineral phosphate, untreated, finely ground, 800 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 800 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then......................	10	932	8	1,408	22	100	16	1,740	11	714	9	664
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898 500 lbs. of Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then...	15	1,534	11	120	25	810	24	10	16	1,017	12	112
7	Mineral phosphate, untreated, finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.................	14	1,347	10	1,380	25	1,020	19	1,210	15	1,014	11	752

EXPERIMENTS WITH FERTILIZERS, ON PLOTS OF INDIAN CORN—*Concluded.*

No. of plot.	Fertilizers applied each year, from 1888 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted.	Average Yield for Twelve Years.				13th Season, 1901.				Average Yield for Thirteen Years.			
		½ Plot No. 1—weight of green fodder		½ Plot No. 2—weight of green fodder		½ Plot No. 1—Thorough'b'd White Flint, weight of green fodder		1 Plot No. 2—Mam. 8 row-ed, weight of green fodder		½ Plot No. 1—weight of green fodder		1 Plot No. 2—weight of green fodder	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive, In 1898 and 1899 500 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then............	11	279	8	456	24	550	22	1,640	12	300	9	701
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..........................	10	264	7	1,309	26	1,600	23	110	11	828	8	1,678
10	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	1,854	10	39	25	20	20	1,200	13	1,713	10	1,667
11	Mineral superphosphate, No. 1, 350 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. No fertilizers have been applied since then..	15	944	11	1,146	28	1,800	23	1,310	16	1,010	12	1,005
12	Unmanured from the beginning...........	10	202	8	500	23	610	19	800	11	233	9	215
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	11	327	8	1,145	24	760	20	1,400	12	360	9	1,011
14	Bone, finely ground 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	11	1,464	8	1,497	24	1,700	22	620	12	1,482	9	1,583
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	384	9	607	22	1,430	18	800	13	3	10	7
16	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers have been applied since then..	12	1,009	9	1,239	23	600	20	300	13	662	10	859
17	Mineral superphoshate, No. 1, 600 lbs.; muriate of potash, 200 lbs.; sulphate of ammonia, 150 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	12	1,297	8	1,773	25	1,590	23	110	13	1,320	9	1,953
18	Muriate of potash, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	8	1,138	5	1,534	25	1,260	21	960	9	1,762	6	1,951
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and '90; (muriate of potash, 200 lbs., substituted each year since); dried blood, 300 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers have been applied since then..	11	458	7	1,225	25	1,830	23	940	12	717	8	1,665
20	Wood ashes, unleached, 1,900 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.	9	1,016	6	1,841	26	800	22	1,500	10	1,615	8	276
21	Bone, finely ground, 500 lbs.; sulphate of ammonia, 200 lbs.; muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..........	12	222	6	692	23	750	21	840	12	1,955	7	1,011

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under, so that the plant food they have taken from the soil may be returned to it. One-half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The preparation of the land has been the same for both these roots. It was ploughed in the autumn after the crop was gathered, gang-ploughed deeply in the spring after the barnyard manure had been spread on plots 1, 2 and 6, and after gang-ploughing the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

In 1889, the variety of mangel used was the Mammoth Long Red. In 1890, three varieties were sown: 15 rows of Mammoth Long Red, 6 of Mammoth Long Yellow, and 6 of Golden Intermediate on each plot. In 1891, each plot again had three varieties: 18 rows of Mammoth Long Red, 3 of Yellow Fleshed Tankard, and 6 of Golden Tankard. In 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899 and 1901, one variety only was used, namely, the Mammoth Long Red. About 4 pounds of seed were sown per acre each year.

Two varieties of turnips were sown on the half plots devoted to these roots in 1889; 25 rows of Carter's Prize Winner, and 2 rows of Carter's Queen of Swedes, and in 1890, a single variety, Carter's Elephant Swede. In 1891, six varieties were sown; 6 rows of Lord Derby Swede, 4 of New Giant King, 3 of Imperial Swede, 6 of Champion Swede, 4 of Purple Top Swede, and 4 of East Lothian Swede. In 1892 the Improved Purple Top Swede only was sown, in 1893 and 1894 the Prize Purple Top Swede, in 1895 the Imperial Swede, and in 1896, 1897, 1898, 1899 and 1901 the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, was prepared in the same manner and the fertilizers spread on it at the same time as for the mangels. It was then allowed to stand until the day before sowing, when it was gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. About three pounds of seed were sown per acre.

In 1900 no crops of mangels and turnips were grown, but clover was sown in their place on May 5 in the proportion of twelve pounds per acre. This made a strong growth, and was cut twice during the season, and left on the ground to decay so that when ploughed under the land might get the full benefit of the clover crop. The clover was allowed to remain growing until May 10, 1901, by which time it had made a very heavy growth. It was then ploughed under about six inches deep and harrowed well, then made up into ridges two feet apart. These were rolled with a hand roller, which flattened the ridges considerably and made a firm, even seed bed. It is proposed to alternate the crops of clover and roots in this way for some years for the purpose of gaining information as to the fertilizing effect of crops of green clover ploughed under on land to be used for growing roots.

In 1901 the mangels were sown on May 13, and pulled on October 14; the turnips were sown May 22, and pulled October 22. The yield per acre has been calculated in each case from the weight of roots gathered from two rows, each 66 feet long.

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS $\frac{1}{20}$TH ACRE EACH.

No. of Plot.	Fertilizers applied each Year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown.	Average Yield for Eleven Years. Mangels, Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Eleven Years. Turnips, Weight of Roots. Per Acre. Tons.	lbs.	12th Season, 1901. Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre. Tons.	lbs.	12th Season, 1901. Varieties. East Half Plot. Turnips, Purple Top Swede: Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Twelve Years. Mangels, Weight of Roots. Per Acre. Tons.	lbs.	Average Yield for Twelve Years. Turnips, Weight of Roots. Per Acre. Tons.	lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 20 tons per acre each year from 1889 to 1898 inclusive. No manure has been applied since then...........	22	1,174	15	183	22	160	21	320	22	1,089	15	1,194
2	Barn-yard manure (mixed horse and cow manure) fresh, 20 tons per acre each year from 1889 to 1898 inclusive. No manure has been applied since then...............	21	1,090	15	607	21	500	20	1,590	21	1,041	15	1,522
3	Unmanured from the beginning......	8	1,587	6	1,863	9	1,610	12	1,820	8	1,756	7	859
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, used each year from 1889 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' Phosphate was used. No fertilizers have been applied since then.....	8	644	7	593	9	940	14	1,520	8	835	7	1,837
5	Mineral phosphate, untreated, finely ground, 1,000 lbs., nitrate of soda, 250 lbs. wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then.	13	1,732	9	1,436	19	350	13	1,130	14	617	10	77
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre; mineral phosphate untreated, finely ground, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1889 to 1897 inclusive. In 1898 1,000 lbs. of Thomas' Phosphate was used in place of the mineral phosphate. No fertizers have been applied since then..	17	1,799	13	536	20	1,380	11	1,800	18	264	13	308
7	Mineral phosphate, untreated, finely ground, 1,000 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899 1,000 lbs. of the Thomas' Phosphate was used in place of the mineral phosphate. No fertilizers have been applied since then....	10	1,472	9	1,012	16	440	10	1,650	11	386	9	1,232
8	Mineral superphosphate, No. 1, 500 lbs.; sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years); nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then...........................	13	1,725	11	1,730	13	820	15	1,720	13	1,649	12	396

EXPERIMENTS WITH FERTILIZERS ON ROOTS; PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of plot.	Fertilizers applied each Year from 1889 to 1898 or 1899. No fertilizers used since. Clover sown in 1900 in place of the roots and ploughed under in May, 1900, before the roots were sown.	Average Yield for Eleven Years. Mangels, Weight of Roots. Per Acre.		Average Yield for Eleven Years. Turnips, Weight of Roots. Per Acre.		12th Season, 1901, Varieties. West Half Plot. Mangels, Mammoth Long Red: Weight of Roots. Per Acre.		12th Season, 1901, Varieties. East Half Plot. Turnips, PurpleTop Swede: Weight of Roots. Per Acre.		Average Yield for Twelve Years. Mangels, Weight of Roots. Per Acre.		Average Yield for Twelve Years. Turnips, Weight of Roots. Per Acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..	9	120	8	1,327	10	770	15	1,180	9	341	9	481
10	Nitrate of soda, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.....	14	520	9	134	13	220	15	700	14	328	9	1,181
11	Sulphate of ammonia, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then...........	10	145	10	667	12	860	16	1,250	12	538	10	1,715
12	Unmanured from the beginning	7	354	6	1,677	7	1,490	11	1,340	7	449	7	482
13	Bone, finely ground, 500 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..... . ..	10	196	8	616	12	1,950	13	850	12	675	8	1,469
14	Wood ashes, unleached, 2,000 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.....	10	1,508	7	1,107	13	40	13	1,060	10	1,886	8	103
15	Common salt (Sodium chloride) 400 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then.. ...	9	961	7	21	12	680	12	900	9	1,437	7	927
16	Mineral superphosphate, No. 1, 500 lbs.; nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..........	13	589	10	711	10	690	17	1,080	13	173	10	1,908
17	Mineral superphosphate, No. 1, 350 lbs; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then ..	12	985	9	31	16	660	20	690	12	1,624	9	1,919
18	Mineral superphosphate, No. 1, 500 lbs.; muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then...........	12	415	9	1,900	19	60	19	200	12	1,552	10	1,425
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since); dried blood, 250 lbs.; mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then..................	13	1,150	11	737	20	1,460	17	1,950	14	342	11	1,838
20	Wood ashes, unleached, 1,500 lbs.; common salt (Sodium chloride), 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then...	14	202	10	183	20	700	19	530	14	1,244	10	1,712
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers have been applied since then...	14	1,190	10	903	16	600	17	680	14	1,482	11	51

DISTRIBUTION OF SAMPLES OF SEED GRAIN, ETC., TO FARMERS FOR TRIAL.

Another distribution was made in the spring of 1901, consisting of samples of the most promising sorts of oats, spring wheat, barley, pease, Indian corn and potatoes. By the careful growing of one of these samples, the product will soon be sufficient to sow a large area, and thus in a short time the farmer can provide himself with some of the best sorts, without cost beyond that of his own labour. From the large number of appreciative letters received from farmers who have had these samples and have grown from them the seed grain they are now using on their farms, it is evident that this branch of the work of the experimental farms is doing a vast amount of good, and is rapidly accomplishing the object for which it was instituted, namely, the general introduction among farmers throughout the Dominion of the best and most productive sorts of these important farm crops. Another proof of the appreciation in which this distribution is held is the very large demand each year for such samples.

The samples sent out from the Central Experimental Farm during the early months of 1901 were distributed as follows:—

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	North-west Territories.	British Columbia.
Oats	371	763	1,012	2,589	1,304	1,422	640	87
Barley	105	278	280	734	305	321	143	27
Wheat	271	381	789	1,856	515	474	243	28
Pease	74	376	337	654	419	627	343	59
Indian corn	27	156	85	451	429	167	56	15
Potatoes	147	511	1,058	1,400	1,256	1,045	460	189
Total	995	2,465	3,561	7,684	4,228	4,056	1,885	405

Total number of samples distributed 25,279
Number of applicants supplied 25,231

The following list shows the number of 3-pound packages of the different varieties which have been sent out:—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		BARLEY.	
		Six-rowed.	
Improved Ligowo	2,325		
Banner	1,181		
Siberian	1,115	Mensury	840
American Beauty	897	Royal	566
Golden Beauty	798	Odessa	228
Bavarian	795	Oderbruch	117
Abundance	403		
Wide Awake	354		
Bonanza	120	*Two-rowed.*	
White Schonen	103		
Tartar King	91	Sidney	354
Waverley	3	Canadian Thorpe	58
Goldfinder	3	French Chevalier	30
Total	8,188	Total	2,193

Name of Variety.	Number of Packages.
Wheat.	
Red Fife	1,151
Preston	916
White Fife	560
White Connell	539
Stanley	484
Percy	392
Wellman's Fife	238
Monarch	191
Hungarian	69
Dufferin	17
Total	4,557
Pease.	
Prussian Blue	675
Large White Marrowfat	533
Canadian Beauty	498
French Canner	486
Creeper	311
Black Eyed Marrowfat	237
Golden Vine	149
Total	2,889
Indian Corn.	
Selected Leaming	492
Longfellow	284
Angel of Midnight	125
White Cap Yellow Dent	119
Early Butler	89
Early Mastodon	78
Mitchell's Early	72
Mammoth Cuban	54
Champion White Pearl	39
Compton's Early	34
Total	1,386
Potatoes.	
Carman No. 1	850
American Wonder	752
Early Sunrise	718
Potatoes—*Con.*	
Everett	625
Early Harvest	519
Empire State	466
Burnaby Seedling	458
Rochester Rose	402
Early Rose	165
Sir Walter Raleigh	109
Canadian Beauty	102
Early Andes	101
Early White Prize	97
Bovee	96
Uncle Sam	95
Vigorosa	92
New Queen	91
Honeoye Rose	77
Prolific Rose	76
Prize Taker	65
Wonder of the World	23
Early Six Weeks	14
Rose of the North	10
Beauty of Hebron	8
Gem of Aroostook	7
Holborn Abundance	7
Brown's Rot Proof	3
White Elephant	2
Maggie Murphy	2
Irish Daisy	2
Lizzie's Pride	2
Dakota Red	2
Early Norther	2
Sharpe's Seedling	2
State of Maine	2
Late Puritan	2
Additional varieties of which only one sample of each was sent	20
Total	6,066
Total number of packages distributed :—	
Wheat	4,557
Oats	8,188
Barley	2,193
Pease	2,889
Corn	1,386
Potatoes	6,066
Total	25,279

DISTRIBUTION OF SAMPLES OF GRAIN SUFFICIENT FOR ONE-TENTH OF AN ACRE.

The distribution of grain in larger samples sufficient in each case for a one-tenth acre plot was begun in 1899, and continued in 1900 and 1901. These samples were sent to a special list of farmers selected from among those who have shown a special interest in this important work. In preparing the list for this purpose the names have been chosen from every part of the Dominion so that every agricultural constituency has been represented.

These special samples to the number of 2,858 have been distributed by provinces as follows:—

DISTRIBUTION of samples of grain sufficient for one-tenth of an acre.

Name of Grain.	P. E. I.	N. S.	N. B.	Quebec.	Ontario.	Man.	N.W.T.	B. C.
Oats	58	151	164	655	847	112	69	24
Spring Wheat	41	37	91	193	72	19	12	5
Barley	15	21	33	127	77	27	6	2
Total	114	209	288	975	996	158	87	31

The following list shows the number of these larger packages of the different varieties which have been sent out:—

Name of Variety.	Number of Packages.	Name of Variety.	Number of Packages.
OATS.		WHEAT—*Con.*	
Waverley	465	Wellman's Fife	2
Tartar King	411	Total	471
Improved Ligowo	346		
American Beauty	288	BARLEY.	
Banner	237		
Golden Beauty	128	Mensury	199
Siberian	110	Royal	109
Goldfinder	94	Total	308
Total	2,079		
WHEAT.		Oats	2,079
Preston	251	Wheat	471
Percy	122	Barley	308
Stanley	94		
Red Fife	2	Total	2,858

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples of three pounds each were also distributed from the branch experimental farms as follows:—

Experimental Farm, Nappan, N.S.—		Potatoes	652
Oats	260		1,629
Wheat	89		
Barley	78		
Pease	22		
Buckwheat	10	Experimental Farm, Brandon, Man.—	
Winter Rye	8	Samples of grain of all sorts	555
Potatoes	278	Potatoes	334
	745		889
Experimental Farm, Indian Head, N.W.T.—		Experimental Farm, Agassiz, B.C.—	
Oats	414	Oats	246
Barley	68	Barley	184
Wheat	252	Wheat	168
Pease	200	Pease	87
Flax, Rye, &c	43	Potatoes	259
			944

These samples added to the number distributed by the Central Experimental Farm make a total of 32,344. It is gratifying to find that farmers generally are paying much more attention than formerly to the selection of the best and most productive sorts for seed.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS FOR 1901.

The number of samples of seed grain and other seeds which were tested during the season of 1901 to ascertain the proportion which would germinate was 2,385. Many of the samples sent for test are much below the average in vitality, and for this reason do not fairly represent the vitality of grain of average quality grown in different parts of the Dominion. The main object in continuing these tests from year to year is to give farmers the opportunity of having any samples which may be of doubtful vitality, through injury during harvesting or storing, thoroughly tested so that their value for seed purposes may be known. Samples may be sent free through the mail, about one ounce is sufficient and the work is done and reported on free of charge. The vitality of samples can usually be ascertained within a fortnight after they are received.

RESULTS OF TESTS OF SEEDS FOR VITALITY, 1900-1.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	900	100·0	8·0	78·5	5·7	84·2
Barley	312	100·0	11·0	78·0	7·5	85·5
Oats	972	100·0	0·0	82·5	5·4	87·9
Rye	2	85·0	4·0	41 5	3·0	44·5
Peas	90	98·0	14 0	....	....	84·0
Corn	12	100 0	2·0	....	....	67·0
Grass	14	97·0	14·0	....	....	59·7
Clover	6	80·0	6·0	....	....	41·5
Flax	9	88·0	12·0	....	....	49·1
Carrots	17	82·0	11·0	....	....	41 0
Turnips	8	82·0	8·0	....	....	53·0
Mangels	10	86·0	60·0	....	....	73·2
Sugar Beets	9	98·0	34·0	....	....	75·1
Radish	11	94·0	46·0	....	....	73·5
Cabbage	6	81·0	13·0	....	....	59·1
Beans	2	72·0	0·0	....	....	36·0
Tobacco	2	32·0	31·0	....	....	31·5
Canary Seed	1	62·0	62·0	....	....	62·0
Cucumber	1	42·0	42·0	....	....	42·0
Total number of samples tested, highest and lowest percentage...	2,384	100·0	0·0	....	....	....

(Signed) WILLIAM T. ELLIS.

TABLE showing the Results of Grain Tests for each Province.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
ONTARIO.						
Wheat	179	100·0	19·0	60·3	11·8	72·2
Barley	112	100·0	11·0	72·2	11·3	83·5
Oats	181	100·0	47·0	90·6	4·2	94·8
QUEBEC.						
Wheat	56	100·0	27·0	82·5	5·3	87·9
Barley	17	100·0	64·0	83·3	6·3	89·7
Oats	82	100·0	23·0	81·7	5·5	87·2
MANITOBA.						
Wheat	441	100·0	8·0	83·0	4·2	87·2
Barley	121	100·0	21·0	82·0	5·0	87·0
Oats	376	100·0	26·0	84·6	5·6	90·3
NORTH-WEST TERRITORIES.						
Wheat	154	100·0	39·0	82·2	3·5	85·7
Barley	38	100·0	39·0	75·1	6·2	81·3
Oats	229	100·0	0·0	68·8	6·9	75·7
NOVA SCOTIA.						
Wheat	25	100·0	52·0	82·4	5·0	87·4
Barley	15	99·0	78·0	83·6	6·3	89·9
Oats	31	100·0	81·0	89·9	3·1	93·1
NEW BRUNSWICK.						
Wheat	26	100·0	59·0	87·2	4·0	91·2
Barley	4	100·0	97·0	97·5	1·2	98·7
Oats	32	100·0	85·0	90·9	4·2	95·2
PRINCE EDWARD ISLAND.						
Wheat	16	98·0	72·0	82·6	5·1	87·7
Barley	5	98·0	72·0	81·0	8·4	89·4
Oats	40	100·0	76·0	92·5	3·6	96·1
BRITISH COLUMBIA.						
Wheat	3	99·0	95·0	96·3	0·3	96·6
Barley	0	0·0	0·0	0·0	0·0	0·0
Oats	1	94·0	94·0	91·0	3·0	94·0

METEOROLOGICAL OBSERVATIONS.

Table of Meteorological Observations taken at the Central Experimental Farm, Ottawa, 1901; maximum, minimum and mean temperature for each month, with date of occurrence, also rainfall and snowfall and total precipitation.

Months.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days, Precipitation.	Heaviest in 24 hours.	Date.
	°	°	°	°	°		°		in.	in.	in.		in.	
Jan	21·30	0·59	20·54	10·86	38·8	16th	—25·5	20th	0·17	32·50	3·42	18	1·30	12th
Feb......	19·84	0·62	19·21	10·22	29·5	19th	—11·8	3rd	0·00	14·00	1·40	7	0·60	4th
March...	32·30	15·13	17·16	23·71	40·5	24th	— 9·5	3rd	1·65	22·25	3·87	18	0·71	27th
April	55·78	36·70	19·08	46·24	79·8	28th	5·0	3rd	3·82	1·50	3·97	16	0·74	4th
May.....	67·07	46·66	20·37	56·84	81·2	8th	36·0	15th	4·36	......	4·36	17	0·95	18th
June.....	78·56	55·52	23·03	67·03	96·8	28th	42·8	8th	3·79	......	3·79	12	1·02	23rd
July.. ..	82·36	59·86	22·49	71·10	99·0	16th	47·9	25th	4·44	......	4·44	14	1·48	30th
August ..	79·58	57·13	22·44	68·35	89·8	12th	49·2	5th	3·12	......	3·12	14	1·44	10th
Sept.	70·95	49·55	21·40	60·25	90·0	5th	33·0	20th	2·98	.. ..	2·98	8	1·17	29th
October..	56 81	38·16	18·65	47·48	72·0	12th	24·8	25th	1·63	s	1·63	12	0·45	19th
Nov	34·69	21·78	13·00	28·28	58·0	1st	— 3·0	29th	1·30	13·75	2·67	16	0·83	25th
Dec......	26·34	11·35	14·98	18·84	53·0	14th	—14·3	16th	1·95	13·25	3·26	15	1·55	15th
									29·21	97·25	38·91	167		

Rain or snow fell on 167 days during the 12 months.

Heaviest rainfall in 24 hours, 1·48 inches on July 30.

Heaviest snowfall in 24 hours, 13·00 inches on January 12.

It will be seen the highest temperature during the 12 months was 99°·0 on July 16.

The lowest temperature during the 12 months was—25°·5 on January 20.

During the growing season rain fell on 16 days in April, 17 days in May, 12 days in June, 14 days in July, 14 days in August, and 8 days in September.

September shows the lowest number of days on which rain fell, viz., 8.

Rain or snow fell on 18 days in January and March.

Total precipitation during the 12 months, 38·91 inches, as compared with 40·27 inches during 1900.

Rainfall, Snowfall and total Precipitation from 1890 to 1901, also the average annual amount that has fallen.

Year.	Rainfall.	Snowfall.	Total Precipitation.
	In inches.	In inches.	In inches.
1890............	24·73	64·85	31·22
1891............	30·19	73·50	37·54
1892............	23·78	105·00	34·28
1893............	31·79	72·50	39·04
1894............	23·05	71·50	30·20
1895............	27·01	87·50	35·76
1896............	21·53	99·75	31·50
1897............	24·18	89·00	33·08
1898............	24·75	112·25	36·02
1899............	33 86	77·25	41·63
1900............	29·48	108 00	40·27
1901............	29·21	97·25	38·91
Total............	323·56	1,058·35	429·45
Yearly average for 12 years............	26·96	88·19	35·78

RECORD of Sunshine at the Central Experimental Farm, Ottawa, for the Years 1898, 1899, 1900 and 1901.

Months.	1898.				1899.				1900.				1901.			
	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per day.	Number of days with Sunshine.	Number of days without Sunshine	Total hours Sunshine.	Average Sunshine per day.
January...	21	10	97·4	3·14	18	13	91·2	2·94	18	13	76·4	2·46	20	11	94·6	3·05
February ..	15	13	67·5	2·41	19	9	102·1	3·64	20	8	110·2	3·93	20	8	120·9	4·31
March.....	26	5	171·5	5·53	17	14	124·1	4·00	26	5	177·9	5·73	19	12	82·4	2·65
April.....	29	1	233·8	7·79	26	4	228·8	7·62	26	4	212·7	7·09	18	12	137·1	4·57
May......	30	1	186·3	6·01	27	4	225·4	7·27	27	4	241·6	7·79	25	6	200·8	6 47
June.......	29	1	184·9	6·16	29	1	257·1	8·57	27	3	282·2	9·40	29	1	269·4	8·98
July......	30	1	272·8	8·80	29	2	271·3	8·75	29	2	225·1	7·26	29	2	245·8	7·92
August....	Instrum'ts out of order.				31	0	271·2	8·74	30	1	270·7	8·73	29	2	226·1	7·29
September..	27	3	166·9	5·23	22	8	128·9	4·29	22	8	164·4	5·48	26	4	202·3	6·74
October....	21	10	106·0	3·41	23	8	120·4	3·88	26	5	148·7	4·79	27	4	126·3	4·07
November..	21	9	91·3	3·04	17	13	77·0	2·56	18	12	71·7	2·39	19	11	72·4	2·41
December...	15	16	54·3	1·75	17	14	50·1	1.61	16	15	34·0	1·09	16	15	45·4	1·46

(Signed) WILLIAM T. ELLIS,
Observer.

CORRESPONDENCE.

The great volume of correspondence continually passing between Canadian farmers and the officers of the Experimental Farms is a gratifying evidence of the usefulness of the work conducted and of the appreciation in which it is held. A large proportion of the letters received are letters of inquiry from correspondents seeking information on all sorts of farm subjects.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters received and sent out at the Central Experimental Farm from November 30, 1900, to November 30, 1901, also the number of reports, bulletins and circulars forwarded by mail during the same period:—

	Letters received.	Letters sent.
Director....	35,711	17,094
Agriculturist....	1,470	1,533
Horticulturist	1,163	1,209
Chemist	1,213	1,127
Entomologist and Botanist	3,058	2,840
Poultry Manager	1,575	1,078
Accountant	1,123	1,293
	45,313	26,174

A large number of letters received by the Director are applications for the publications of the farms or for samples of grain. A considerable proportion of these are

answered by sending the correspondents the material asked for. This will explain why the number received so much exceeds the number sent out.

Circular letters sent, including circulars sent with samples of seed grain	34,160
Reports and bulletins mailed	257,617

BRANCH EXPERIMENTAL FARMS.

The correspondence with the superintendents of the branch experimental farms is also large as will be seen from the following figures:—

	Letters received.	Letters sent.
Experimental Farm, Nappan, N.S.	1,416	1,211
Experimental Farm, Brandon, Man.	4,804	2,755
Experimental Farm, Indian Head, N.W.T.	5,410	5,333
Experimental Farm, Agassiz, B.C.	2,518	2,378
	14,148	11,677

Much additional information has also gone out from the branch farms in printed circulars.

Adding the correspondence received at the Branch Experimental Farms to that of the Central Farm, we find that 59,461 letters were received, and 36,851 sent out during the past year in addition to the vast amount of information distributed in reports, bulletins and circulars.

EXPERIMENTS IN TREE PLANTING ON SABLE ISLAND.

Sable Island lies in the Atlantic about 90 miles east from the nearest point in Nova Scotia, and about 153 miles from Halifax. In form it is a long, slender, open crescent with the hollow side facing the mainland and running out to a point at either end. It is about 21 miles long, and at its widest parts is more than a mile across; a good portion of the middle of the island is occupied by a lagoon of salt water known as Lake Wallace, which at some points covers nearly half the width of the island and extends for more than half its length. A break has occurred in the south bar which forms the southern boundary of this lagoon through which the sea water enters in considerable volume.

WASTING OF THE ISLAND BY THE ACTION OF THE SEA.

The island consists in the main of white sand forming banks and hills of varying height. The strong winds which prevail at certain periods, sometimes play havoc with these sandy elevations, thus continually altering the configuration of the land. The sea has made great inroads on the west end of the island and has within the memory of the present residents washed away several miles of that end which has made it necessary to remove the lighthouse there twice within fifteen years. Early surveys give the length of the island as about 40 miles, and two miles or more in width, showing that great waste has occurred. Dangerous shoals and sand bars extend on all sides, and the strong ocean currents from the south and the north which set in about the island, often carry vessels out of their course. Add to this the prevalence of fogs which obscure the land from view and you have a combination of dangerous conditions which have brought about the destruction of many good ships and involved the loss of hundreds of lives.

MANY DISASTROUS WRECKS.

The appalling loss of life and property which has occurred in this dangerous spot early led to the establishment there of life saving stations. These were organized by the government of Nova Scotia in 1801, and maintained by that province until confederation took place, when this service was undertaken by the Dominion. The British government contributes £500 a year towards the cost of carrying on this good work.

Many disastrous wrecks have occurred here. The first of these recorded was in 1583, when the *Admiral*, a vessel in the navy of Queen Elizabeth, was wrecked and nearly 100 lives lost. Up to the present time no less than 171 known wrecks have occurred. The last wreck of importance, comparatively speaking, was that of the steamship *Moravian*, from Antwerp to Boston. This was a vessel of 2,000 tons, which struck on a sand bar on the 12th of February, 1899, and broke up the following June. There were 40 persons on this steamship, 21 of whom reached the island in their own boats, while 19 were rescued by the island lifeboats. No one was drowned in this instance, but one man died from the effects of exposure. It has been truly said that 'no other island on this globe can show so appalling a record of shipwreck and disaster.'

THE ISLAND TREELESS.

There are no trees on Sable Island to break the force of the winds, which sometimes blow fiercely and raise dense clouds of drifting sand. The gradual wasting of the island and the lessening of its surface has led to the consideration of the possibility of establishing tree growth there, that thus the land might become more fixed and further lessening of the surface be retarded if not prevented.

INVESTIGATIONS LOOKING TO TREE PLANTING.

During the early part of 1900, I was requested by the Minister of Marine and Fisheries, Sir Louis Davies, to consider the subject of a somewhat extensive experiment in tree planting on Sable island, and if this was thought feasible to make the necessary arrangements to obtain a sufficient number of such trees as would be desirable for that purpose. Having obtained the ready concurrence of the Hon. Minister of Agriculture to devote such time as was necessary to carry out this object, steps were taken to gain information on the subject. From the outset I have had the hearty cooperation of the deputy minister, Lieut.-Col. F. F. Gourdeau, who has been most enthusiastic in the work, and has been of the greatest assistance to me. During my visit to the Paris Exposition in 1900, a journey was made to the sea coast of Brittany with Lieut.-Col. Gourdeau to see the results of the planting of pine forests there on the drifting sands on the ocean shore, to gain information as to the methods adopted in planting and the varieties of trees which have been successfully grown.

We found large districts planted with pine trees growing thriftily, although slowly, on what 50 or 60 years ago was a bare and barren coast covered with drifting sand. Formerly houses and villages were at times engulfed by these terrible drifts, but under the influence of this successful planting, the drifting of the sand has long since ceased and a soil is gradually, though slowly, forming mainly through the decay of successive crops of the needle-like leaves of the pines. A careful survey of the district showed that the trees were almost all of one species known as the maritime pine *Pinus pinaster* (*P. maritima*) known also in Europe as the cluster pine. In that locality it is a rather small growing tree with large long leaves and very large cones. The trees throughout the district of country visited between St. Nazaire and Baule seemed to range from 20 to about 50 years of age ; their height was from 15 to 25 feet, and the trunks of some of the larger specimens, when measured, three feet from the ground showed a diameter of about 12 inches. Specimens of other species of pine were occasionally found growing

with the maritime pine especially *Pinus sylvestris,* and notes were taken on these as to their comparative vigour of growth on the apparently pure sand of the district. A careful study was also made of other varieties of trees and shrubs seen growing here and there on that soil, and a complete list made with notes on their growth. The information thus gained was subsequently used to good purpose when selecting the material to be tested on Sable Island.

VISIT TO NORMANDY.

I also made a journey to the district of Calvados in Normandy, which is known throughout the world among nurserymen for its large tree-growing establishments, where an immense number of young forest trees are produced. With an excellent climate for this purpose, cheap labour and long hours for work, and the employment of the best methods, young trees are produced there of thrifty growth in millions, and with such advantages they can be supplied at very low rates. The stock of one of the larger nurseries was inspected and plenty of suitable material found. The maritime pine especially was grown in very large quantities, as this tree is extensively planted in many parts of France. Many other species of pine and other evergreen trees were also available there with a large assortment of deciduous trees and shrubs.

SELECTION OF SUITABLE VARIETIES.

On returning to Ottawa a list of such sorts as were likely to be suitable was prepared with quantities desired. The trees and shrubs chosen included a large number of those which have succeeded well in drifting sands in France to which were added a number of other varieties which from Canadian experience were likely to prove useful for that purpose. Small lots of many other species were added to lend interest to the collection and to test their hardiness and adaptability to the climate of Sable Island. This list included in all 68,755 evergreens of 25 varieties, and 12,590 deciduous sorts of 79 varieties, a total of 81,345, made up as follows:—

TREES BROUGHT FROM FRANCE.

Number	Name.	Number	Name.
	Evergreens.	10	*Cupressus pisifera filifera*, Thread-like Retinospora.
10,000	*Pinus pinaster = P. maritima*, Maritime or Cluster Pine.	10	" " *plumosa*, Plumose Retinospora.
10,000	" *sylvestris*, Scotch Pine.	10	" " *plumosa aurea.*
10,000	" " *rigaensis*, Riga Pine.	25	*Taxus baccata*, European Yew.
10,000	" *Laricio nigricans*, Austrian Pine.		*Deciduous Trees and Shrubs.*
5,000	" *Montana*, Mountain Pine.	500	*Acer Negundo*, Box Elder.
2,500	" *Montana Mughus*, Dwarf Mountain Pine.	500	" *platanoides*, Norway Maple.
2,500	" *strobus*, White Pine.	10	" " *Schwedleri*, Schwedler's Norway Maple.
100	" *rigida*, Pitch Pine.	50	" *saccharinum*, Sugar Maple.
50	" *cembra*, Stone Pine.	50	" *tataricum*, Tartarian Maple.
10,000	*Abies excelsa*, Norway Spruce.	25	*Vitis (Ampelopsis) quinquefolia*, Virginia Creeper.
2,500	" *balsamea*, Balsam Spruce.	10	" *Thunbergii*, Japan Ivy.
2,500	" *alba*, White Spruce.	5	*Aristolochia sipho*, Dutchman's Pipe.
1,000	" *nigra*, Black Spruce.	25	*Berberis vulgaris foliis purpureis*, Purple Barberry.
1,000	*Juniperus virginiana*, Red Cedar.	10	" *Thunbergi*, Thunberg's Barberry.
1,000	" *communis*, Common Juniper.	2,000	*Betula alba*, European White Birch.
500	*Thuya occidentalis*, arbor vitæ.	10	" " *laciniata pendula*, Cut-leaved Birch.
10	" *columbia.*		
10	" *Elwangeriana.*		
10	" *globosa.*		
10	" *Hoveyi.*		
10	" *lutea.*		

SCENES ON SABLE ISLAND.

1. Landing place with lookout in the distance.
2. Young seal on the shore.
3. Residence of Superintendent.
4. Surfboat pulling through the breakers.
5. Lighthouse at East point.
6. Heeling in young forest trees.
7. Sand binding grass with plain of drifting sand beyond.
8. Surf boats on way to steamer for supplies.

TREES BROUGHT FROM FRANCE—*Concluded.*

Number	Name.	Number	Name.
	Deciduous Trees and Shrubs—Con.		*Deciduous Trees and Shrubs*—Con.
25	*Betula lutea*, Yellow Birch.	200	*Populus alba*, Silver Poplar.
25	" *nigra*, River Birch.	200	" *balsamifera*, Balsam Poplar.
10	*Tecoma grandiflora*, Trumpet Flower.	200	" *deltoidea (= P. monilifera).*
25	*Caragana arborescens*, Siberian Pea Tree.	200	" *nigra pyramidalis*, Lombardy Poplar.
25	*Catalpa Kempferi*, Japanese Catalpa.	500	*Prunus spinosa*, Black Thorn.
25	" *cordifolia*, Western Catalpa.	50	*Ptelea trifoliata*, Wafer Ash.
10	*Chionanthus virginica*, Fringe Tree.	100	*Pyrus aucuparia* Eur. Mountain Ash.
100	*Clematis Vitalba*, Traveller's Joy.	100	*Rhamnus catharticus*, Common Buckthorn.
25	*Cornus alba sibirica*, Siberian Dogwood.	100	" *frangula*, Alder Buckthorn.
10	" " *variegata*, Variegated Siberian Dogwood.	25	*Rhus cotinus*, Smoke Tree.
		50	Roses, Hybrid perpetuals, 10 varieties.
25	*Crataegus Oxyacantha*, English Hawthorn.	200	*Salix argentea*, Silver Willow.
10	" " *fl. rosea plena*, Double red-flowering English Hawthorn	200	" *laurina*, Laurel-leaved Willow.
		10	*Sambucus nigra aurea nova*, Golden Elder.
25	" *pyracantha.*	25	*Spiræa arguta.*
25	*Deutzia crenata*, Crenate Deutzia.	10	" *Japonica Bumalda*, Anthony Waterer
25	*Diervilla (Weigelia) florida.*	25	" *prunifolia.*
25	" *rosea.*	25	" *Van Houttei.*
10	*Elæagnus multiflora.*	10	*Syringa Japonica*, Japan Lilac.
625	*Euonymus Japonicus*, Japan Euonymus.	25	" *Josikaea*, Josika's Lilac.
25	*Forsythia suspensa*, Golden Bell.	25	" *chinensis*, Rouen Lilac.
500	*Fraxinus excelsior*, European Ash.	10	" *vulgaris*, Chas. Xth.
1,000	*Genista sagittalis = (G. Scoparia).*	10	" " *alba*, White Lilac.
2,000	*Gleditschia triacanthos*, Honey Locust.	25	" " de Marly.
10	*Halesia tetraptera*, Silver-bell Tree.	25	" " 6 named varieties.
200	*Hippophæ rhamnoides*, Sea Buckthorn.	500	*Ulmus americana*, American Elm.
25	*Hydrangea paniculata grandiflora*, Japanese Hydrangea.	25	*Viburnum Lantana*, Wayfaring Tree.
		25	" *Opulus sterilis*, Snowball.
500	*Juglans nigra*, Black Walnut.	10	*Wistaria magnifica.*
500	*Ligustrum amurense*, Amur Privet.		The following fruitbushes were included in this order:—
25	*Lonicera Belgica*, Belgian Honeysuckle.		
25	" *sempervirens*, Scarlet Trumpet Honeysuckle.	50	Currants, White Dutch.
		25	" Black, Lees Prolific.
25	" *tatarica grandiflora rubra*, Tartarian Honeysuckle.	25	Gooseberries in 4 varieties. This order also included 50 lbs. of the seed of the Maritime Pine, *Pinus pinaster.*
500	*Lycium Europeum*, Matrimony Vine.		

TREES, ETC., SENT FROM OTTAWA.

Some further material for planting was also taken from Ottawa. This included 1,000 cuttings of *Salix longifolia*, a willow with creeping roots, which grows luxuriantly on the banks of the Saskatchewan river at the Experimental Farm at Brandon. This willow promises to be a good soil binder. As supplementary to the supply of fruits, there were also the following:—

101 Currant bushes, red, white and black, in 23 varieties.
28 Gooseberries, in 5 varieties.
39 Raspberries, in 3 varieties.
254 Strawberries, in 12 varieties.
23 Dwarf June berry.
19 Sand Cherry.
13 Beach plums.
75 Pyrus baccata.
48 Pyrus prunifolia,

Also 6 *Eleagnus argentea* (Wolf willow), a small collection of rhubarb roots, a number of varieties of perennial flowering plants, and an assortment of seeds of trees, shrubs and plants of the hardiest sorts.

THE EXPEDITION STARTED.

As soon as the shipment of trees from Normandy had reached Halifax preparations were made for our departure. The party comprising the expedition was Lieut.-Col. F. F. Gourdeau, Deputy Minister Marine and Fisheries, Mr. W. E. Saunders, of London, Ont., Mr. Thomas Davies, of Ottawa, and myself. We arrived in Halifax on May 14 at 10 p.m., where we were met by Commander Spain, in charge of the government steamers, who informed us that the steamer *Minto* was in waiting with steam up and that everything was ready for an immediate start for Sable Island if we wished to go at once. After consultation we found this was not quite practicable, so we went on board and rested until morning. The obtaining of some additional supplies occupied the next morning, and it was 2 p.m. before the steamer left. When we got well out to sea we found a rather heavy swell, and as evening approached the captain decided that we could not reach the island that night so we headed for Liscombe harbour, which is about the nearest point on the mainland to Sable Island where we arrived about 9 p.m., finding there smooth water and good anchorage. About 4 a.m. the anchor was weighed and the steamer followed a direct course to the island. The sea was fairly heavy, but we made good progress, sighted the island at 10.30 a.m. and anchored at 11.30, about a mile from the shore, which is as near as large vessels can safely come owing to dangerous sand bars which extend in several directions from the land.

ARRIVAL AT THE ISLAND.

As soon as the steamer was sighted signals were run up from the look-out point on shore, and one of the large surfboats was soon got out and manned and on its way to the ship. The Superintendent of the island, Mr. R. J. Boutellier, came in this boat and extended a cordial welcome to us to the island. A load of supplies with the baggage of the party was first landed, and the next trip we were all taken ashore. On the way to land we were several times surrounded by shoals of large cod-fish which were sporting about and jumping out of the water in a very vigorous way. We also met a number of seals near the shore, which poking their heads above water eyed us with great curiosity, while hundreds of terns were flying just overhead making very discordant screams. As there is no harbour, wharf or sheltered landing place on any part of the island the only way of reaching the shore is to ride in on the crest of the breakers. In this way the visitors reached within a few yards of the island when they were carried to dry land on the shoulders of some of the sturdy officials who trod the water as if it might have been their native element. As the sea was comparatively calm there was but little difficulty experienced in getting ashore.

INTERESTING SCENES.

On landing the scene was one of great novelty and interest. The island is a singular formation, the larger part consisting of bluffs and rolling hills of white sand varying in height from 20 to 100 feet, much of which is partly held together by the roots of a sand-binding grass *Ammophila arenaria,* while considerable areas are covered with loose sand which is blown about by the strong winds which prevail there, hence the configuration of the surface is ever changing. Near our landing place was the boat-house which has been built in a large gully which has been formed by the tearing away of a high sand cliff by the wind. Near the west side of the gully stood a pyramid of sand which had originally been a part of a continuous cliff running from east to west. The gully had apparently been worked out in two parts, and when the excavation was complete this pyramid was left standing between the two, a perfect cone from 30 to 40 feet in height. Passing up through this gully we got our first view of the interior of the island. From the hill tops on the north side the land sloped away

southward in a very irregular undulating manner until it almost reached the level of the ocean. Before us lay the Superintendent's house, painted white, with an acre or two of timothy and clover in front of it which was as green as a pasture field on the main land. Beyond the house lay the large inland lake of salt water which occupies so large a part of the interior of the island. Beyond that was the south bar built up of varying heights by the shifting sand, and outside this the ever rolling breakers of the turbulent ocean.

UNPACKING AND HEELING IN THE TREES.

We were soon comfortably lodged with the Superintendent's hospitable family, where we were to spend a busy week, and the remainder of the afternoon and evening was spent in looking over the ground to find a suitable location where we could unpack and heel in our precious cargo of trees. In the meantime the Superintendent had manned another surfboat, and by dint of much hard rowing our 18 large cases of trees, together with the stores brought for the island were all landed on the beach before night fall. The side of the sand gorge on the way up from the boat-house was chosen as a suitable and convenient place for the heeling in of the trees, and early next morning two sturdy yoke of oxen were engaged in hauling the ponderous boxes from the sea shore to this spot. By 7 a.m. all available hands were at work at the trees, some opening and unpacking the cases, others digging trenches in the moist sand in which the young trees were placed and the roots well covered. By the time evening came 16 of the 18 boxes were unpacked, and the remaining two were finished on Saturday morning. The young trees came out in very good condition. They had been six weeks packed, a little mould was occasionally found on some of the roots and stems and a few of the evergreens were partly decayed, but the injured specimens formed a very small proportion of the shipment. The trees had been skilfully packed so as to admit air to all parts of the interior, and the great bulk of the material was quite green and fresh looking. The early part of Friday was fine and bright, but cool, later in the day there was a little rain and towards evening it was quite windy.

STARTING THE FIRST PLANTATION.

On Saturday the 18th, after finishing the unpacking of the two remaining cases of trees and the boxes of fruit bushes, &c., which were brought from Ottawa, the first plantation of trees on the island was started on the upper part of a sandy bluff near the north shore, and north-east of the look-out station. This was fairly well covered with the sand binding grass *Ammophila arenaria,* and was partly protected by a ridge all around, leaving the part chosen for planting in the form of a shallow basin. In this plantation the trees were put from 2½ to 3 feet apart each way among the grass without any preparation of the land. The planting was begun just under the ridge on the south side, and was done as follows:—A spade was pressed down to its full depth in the sand, and pressed backwards and forwards several times until an opening had been made, when the spade was withdrawn and the young tree inserted so as to have its roots well underground when the sand was pressed against the tree firmly with the foot. In planting two men worked together, one used the spade and the other inserted the trees and pressed the sand firmly about the roots with his foot. Before the day closed a large number had been thus planted. The soil at this point seemed to consist wholly of pure sand, no humus could be detected in it.

CHURCH SERVICE ON SUNDAY.

On Sunday morning a church service was conducted by the Superintendent of the island, Mr. Boutellier, who read the service of the Anglican Church and a short sermon

afterwards. There were 14 or 15 present, and all joined heartily in the singing. The musical part of the service was greatly aided by the piano played by Mrs. Boutellier, and a violin played by her son. The service was interesting and impressive. The congregation were summoned by a bell mounted outside the building which had been got from a wrecked vessel. A good deal of the furniture in the dwellings on the island consists of articles rescued from similar disasters; indeed one finds reminders on all hands of wrecks.

LOOKING OVER THE GROUND.

In the afternoon a walk of several miles was taken along the shores of the lagoon, and some promising sites for other tree plantations examined. During this ramble a considerable area of ground was found which was covered with 3 or 4 inches of black peaty soil mixed with sand and with pure sand underneath. On this land the common juniper was growing, also masses of crowberry, *Empetrum nigrum* and quantities of wax myrtle (*Myrica cerifera*), blueberry (*Vaccinium*), wild rose and other plants. Doubtless this dark peaty layer has been formed from the gradual decay of many successive crops of these plants and shrubs. The weather was more or less foggy during the greater part of the day, clearing up at intervals, with a strong wind from the north which worked up a very stormy sea and the breakers were so powerful that it would not have been practicable to have gone out to a ship in such weather.

ADDITIONAL PLANTATIONS BEGUN.

On Monday morning, May 20, we were all early at work at the trees with the available force so divided that planting was carried on during the day at three different points. The weather was foggy, windy and cold, but plenty of exercise induced warmth. A plantation of trees was put out in front of the Superintendent's house, another on the east side, and a third was put in the Superintendent's garden. In the latter enclosure, which was a good sized piece of ground, all the small fruits were planted, all the smaller lots of shrubs and trees and 10 or 12 each of all the other varieties. Hence in that plantation specimens of all the different sorts under trial are ranged side by side under similar conditions. The garden plot, originally sandy, had with the frequent application of manure from the barn and stables become somewhat loamy, so much so as to grow vegetables fairly well. In such soil many of the trees and shrubs are likely to do well. The plantation in front of the Superintendent's house is nearly pure sand, that on the side has a little loamy material in it, and another at the back of the house is of the same quality. As the result of this day's work several thousand trees were placed.

EVENING SEARCH FOR TERN'S EGGS.

Towards evening three of us went across Lake Wallace in a boat to the south side for tern's eggs, as we found them very good eating. On landing we found the eggs quite plentiful. There were thousands of the birds flying around screaming and swooping down towards us in a most threatening manner. Their nest is simply a little hollow place worked out in the sand with sometimes a few bits of sea-weed in it, usually eel grass, but this is exceptional. In these nests which were scattered all over the surface, and more numerous on elevated knolls, we found from one to three eggs. In a short time our party gathered over twelve dozen. In most nests there was only one egg, in from ten to twenty instances two eggs, and in one nest only, three eggs. There would doubtless have been more eggs in some of the nests, as three is the usual number these birds lay, but for the fact that they had been gathered on that part of the shore two days before when we had a large supply for breakfast.

HOW COOKED AND SERVED.

In cooking these eggs they are usually fried. A large number are broken and put into an open dish where the little round bright coloured yolks looked quite pretty in their transparent surroundings. When a sufficient number are ready they are turned into a frying pan and cooked—without breaking the yolks—until the mass is quite firm. It is then turned out on a plate, cut in pieces and served. A slice cut through the mass looks quite attractive, and with the hunger which comes with plenty of exercise in a very invigorating atmosphere they seemed delicious. There was no lack of appetite however with any of our party, and we were always ready for our meals.

A JOURNEY THROUGH THE ISLAND.

As our steamer was to come for us on Thursday it was decided to devote Tuesday to an excursion down the island, 15 miles to the East Light. We had breakfast at 6.30 a.m., and started at 7 o'clock sharp. Three of the party rode on ponies and the others in vehicles. The morning was foggy, but the fog soon lifted, and we had a lovely bright day. On our way we found a very suitable spot for a large tree plantation, about 1½ miles east of the main station, a large undulating depression with protecting ridges all around, and covered with peaty soil three or four inches deep. There a large quantity of trees were subsequently planted, and the grove is now known as Gourdeau Park. This drive was a most interesting one and revealed to us all the main characteristics of scenery on the island. It was evident at many points that during the strong gales the wind played havoc with the loose sand, often materially changing the contour of the surface in a single season. Drifts had occurred in some places so deep as to bury the telephone poles, in others their bases would be blown bare. On our way we passed a building which had just been fitted up for a school. This is a new thing for the island.

POPULATION OF THE ISLAND.

The entire population distributed about and between the two lighthouses, which are about 18 miles apart, number 45. There are 18 men, six of whom are married, and their wives and children make up the remaining number. The number of children needing school privileges is from 10 to 12, and hitherto they have had no means of education, excepting what they could get in their homes. An arrangement has now been made for a teacher and the children who do not live within walking distance will come to the school on Monday morning and return home on Friday evening, boarding in the school house and occupying dormitories there at night. This school will be a great boon to the people.

ORGANIZATION OF THE LIFE-SAVING SERVICE.

The men on the island are divided into small groups so arranged at different points as to admit of the inspection of every part of the shore of the island twice each day. All the stations are connected by telephone with the Superintendent's residence, and reports are made to him morning and evening by each station. At the main station there are five men who take the inspection of the coast alternately for 10 miles—five miles on either side. The west end lighthouse men take charge of about six miles. The men at No. 3 station, which is nine miles east of the main station, inspect 10 miles of coast line. Those at No. 4, which is 14 miles distant, inspect 12 miles in the morning and 24 miles in the evening, and the men at the east end lighthouse have the inspection of 12 miles of coast line in the morning and none in the evening.

In this way provision is made for a careful inspection of every part of the shores of the island twice each day. When the day is clear, inspection can be made with glasses from certain look-out points, but in foggy weather, which is very common, the whole distance must be travelled over and the result telephoned to the Superintendent. Island ponies are used in travelling. In case a vessel is seen flying signals of distress this is reported at once to the Superintendent, who gives prompt instructions as to what is to be done and proceeds with all speed to the scene of action. There are three life-saving stations, the central one, No. 3, and No. 4, where life boats and other life-saving appliances are kept, and a life-saving crew can be assembled at either of these stations in about half an hour.

RECENT HARDSHIPS OF FISHERMEN.

The fishing for cod on the banks is usually done in small boats with two men in each, and each fishing schooner is supplied with several of these boats. In foggy weather the men sometimes lose sight of their ships and drifting to sea are lost. A few days before we arrived two boats had drifted to the island, each containing two French fishermen; one boat had been out for five days, the other for two days, and during this time the men after the first day had nothing to eat but raw fish. The men who were five days out reached the shore of Sable Island in a very exhausted condition, scarcely able to crawl. Another boat also with two men had for a time been in company with one of the two boats saved, but after the first day they parted. Nine days later this boat drifted to the island shore bottom upwards. There are generally more or less cases of this sort every year.

Substantial wooden buildings have been erected by the Government at different points to serve as shelters for shipwrecked people which are fitted up with beds and sleeping berths and provided with bedding. Sufficient stores of food are also kept on the island to feed for some time a considerable number of people so that there may be enough for the crew and passengers of any ship which may be so unfortunate as to be wrecked here.

The remains of many wrecks were seen during this drive, the most prominent of which was the *Crofton Hall,* a good sized iron vessel, which was wrecked some three or four years ago and still remains unbroken, embedded in the sand on the bar at the eastern extremity of the island. We visited station No. 4, where some additional sites for tree planting were selected, we examined the life-saving appliances there and visited also the eastern lighthouse.

On the return journey we drove along the north beach for some miles, here seals were very abundant in large bands, of about 50 to 200, lying on the shore enjoying the warmth of the sun. As we approached the members of the flock would raise their heads in alarm and wobbling along in their own jerky way with a sort of undulating movement they soon reached the water. Their style of moving on land was very ludicrous. Sometimes the young seals which cannot travel fast are left behind and may then be easily caught. After a very pleasant and most interesting drive we reached the main station a little before sundown.

REACHING THE END OF OUR VISIT.

Wednesday was our last working day, the weather was bright and tree planting was pushed along rapidly, and by the close of this day we had succeeded in planting in all about 10,000 trees, leaving 71,000 still for the Superintendent and his men to plant before the work would be completed.

On Thursday morning there was a dense fog, the work done was reviewed and full instructions left with the Superintendent in reference to the completion of the planting. About 10.30 the fog lifted when our steamer was seen about a mile from the

shore awaiting our arrival. We had, on the whole, favourable weather. The temperature had varied during the week spent on the island from 38 to 57—the latter being our hottest day. We bade our hospitable friends farewell with much regret as our stay had been most enjoyable. The surf boat was got out, but the sea was heavy, and it was no easy matter forcing it through the breakers. Many attempts were made and the boat thrown back repeatedly on its side before the resistance of the water could be overcome. Eventually it was pushed through and started on its first trip with the baggage and part of the passengers. In the course of 30 or 40 minutes the boat returned.

THE DEPARTURE.

After much struggling with the breakers the boat was finally got into position again, and on the word of command being given the passengers and boatmen jumped quickly in and with a united effort on the part of the crew and their assistants on shore the boat was started. With a hearty pull she mounted the first breaking line of surf and was fairly afloat. At first she dipped high and low as we passed through the several lines of breakers, but in a few moments more she was fairly clear of these, and we were then rocked in the swell of the ocean. The getting off was exciting and we were tossed about considerably before we reached the side of the steamer where the passengers climbed up in turn the companion gangway and were soon safe on board.

We now bade our host, the excellent and capable Superintendent of the Island, farewell, giving our parting injunctions concerning the trees, the surf boat went off and we started for Halifax. The sea was very rough, and the steamer pitched and rolled continuously during the afternoon and through the night, but we landed safely at Halifax on Friday morning at 6.30.

SAMPLES OF SOIL FOR ANALYSIS.

I brought with me a sample of the almost pure sand forming the soil on the top of the sandy bluff on which the first plantation was made in which the sand binding grass was growing, also two samples of the black peaty layer which covers the sand to a depth of 3 to 4 inches over a large portion of the central part of the island, probably to the extent of 1,800 to 2,000 acres. One of these was taken from the large area chosen for the plantation to be known as Gourdeau Park, and the other was from similar soil some miles further east. I also brought a sample of similar material picked up on the beach on the south shore where it was being washed by the sea. A fifth sample consisted of a bunch of the sand-binding grass *Ammophila arenaria.* These were submitted to the Chemist of the Experimental Farms, Mr. F. T. Shutt, for analysis, who reports on them as follows:—

'ANALYSIS AND REPORT ON SAMPLES FROM SABLE ISLAND.

By Frank T. Shutt, Chemist, Dominion Experimental Farms.

'No. 1. Sample of the sand from field on top of the bluff, north-east of the look-out, where first forest clump was planted. It contains roots of grass *Ammophila arenaria.* Weight of sand, 2 pounds 13 ounces, containing ¾ ounces of grass roots.

'Analysis of this sand after separation of the greater part of the fibre showed ·0018 per cent of nitrogen.

Digestion of this sand with hydrochloric acid (sp. gr. 1·115) at the temperature of boiling water for 5 hours, showed that ·412 per cent had passed into solution.

The examination of this acid solution gave the following data :—

Oxide of iron and alumina	·328
Lime	·062
Phosphoric acid	·012

Potash :—By the spectroscope, traces of potash were plainly discernable. With the usual reagent (platinic chloride) only a very faint precipitation was obtained when working on an acid solution from 10 grams of the sand.

'No. 2. Sample of peaty soil from surface underlaid by sand in central part of island 1½ miles east of residence of Superintendent where a large block of trees has been planted, locality known as Gourdeau Park, layer 3 to 4 inches thick.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	4·87
'Organic matter	22·22
'Mineral matter practically sand	72·91
	100
'Nitrogen in organic matter	·878

'No. 3. Representative sample of peaty soil covering a large area some distance east of where No. 2 was taken, from 3 to 4 inches deep, and underlaid by sand. Weight soil, air-dried, 3 pounds 12½ ounces, containing 5½ ounces fibre.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	1·48
'Organic matter	8·63
'Mineral matter practically sand	89·89
	100
'Nitrogen in organic matter	·271

'No. 4. Sample from a large lump of peaty soil found on the beach on the south shore, being washed by the sea. It contains a considerable amount of semi-decayed eel grass *Zostera maritima*. Weight of soil, air-dried, 1 pound 5 ounces, containing 2½ ounces fibre, principally eel grass.

'Analysis of (air-dried) peaty soil:—

	p. c.
'Moisture	3·00
'Organic matter	9·50
'Mineral matter practically sand	87·50
	100
'Nitrogen in organic matter	·267

'The above three samples are similar in character, and no doubt also as to origin. They may be considered as semi-decayed vegetable matter (largely fibrous) and sand, and practically the only point of difference between them lies in the varying proportions of these two constituents. In the air-dried condition the sand can be very easily separated from the organic matter by shaking and sifting, showing that there is no intimate incorporation of these constituents as in the case of true soils.

'The plant food they contain other than nitrogen is present in very small amounts, and we must suppose exists in such a condition that it is only slowly set free for plant use.

'No. 5. Analysis of the (air-dried) grass or hay *Ammophila arenaria* from Sable Island, chiefly barren stems :—

	p. c.
Moisture	12·42
Protein	13·81
Fat	·81
Fibre	41·00
Carbo-hydrates	26·71
Ash	5·25
	100

'In protein or albuminoids this grass makes a very good showing, being quite equal in respect to these important nutrients to many of our highly esteemed cultivated grasses.

'The percentage of fibre is above the average, and this together with the somewhat high protein, necessarily makes the carbo-hydrates (starch, sugar, &c.) much lower than usual. This hay contains 5·25 per cent ash or mineral matter, which on further examination is found to include 1·37 per cent of sand. This sand had remained attached to the grass in spite all care being taken to separate it.

'The indications are that though probably somewhat less digestible than the best hays made from grass cut before seeding, this Sable Island grass has a distinct and even moderately high feeding value due to its comparatively speaking large protein content.'

The results obtained by Mr. Shutt are very interesting and valuable. The ponies, of which there are four bands numbering about 120 in all running wild on the island, feed almost entirely on this grass which looks tough and hard and does not impress one as likely to be very nutritious. The ponies, however, do well on it, and even the domestic cattle use it considerably, although they are said to prefer timothy and clover. The fact that this grass has a decided nutritive character is now demonstrated.

ARRANGEMENTS FOR THE USE OF ARTIFICIAL FERTILIZERS.

Realizing at the outset that it was probable that the soil of some of the sites which might be chosen for tree planting on the island would be deficient in the elements of fertility needed for the healthy growth of trees, a sufficient quantity of artificial fertilizers was taken to Sable Island with the trees. These included nitrate of soda, muriate of potash, superphosphate of lime with a few barrels of quick lime. Instructions were left with the Superintendent as to the use of these after the trees were planted, and the proportions in which they should be mixed. That after mixing they should be diluted with an equal bulk of sand and scattered in small proportion over the ground once a month for three months, leaving a small portion of each plantation untreated for comparison. This would probably give the trees at the start sufficient plant food for healthy growth.

A NATURAL SOURCE OF PLANT FOOD.

There is one source of plant food on Sable Island which should not be overlooked. Sea birds are most abundant there. After travelling over the greater part of the island and seeing the immense number of terns everywhere, from a rough computation of the number per acre and the acreage of the island we estimated that these birds alone did not fall far short of a million on the island. They feed on small fish, and they are so incessantly active that they consume large quantities and their droppings are seen on every hand. This perennial source of fertility must have its effect. Like the guano

on the sea-girt islands in parts of South America this material is very rich in plant food, which is in readily soluble forms and the quantity deposited every year would probably be sufficient to supply a considerable part of the small proportion of these elements needed for healthy tree growth. Traces only of these useful elements are found in the clear, pure sand which covers so large a part of the surface of the island, probably for the reason that this fertilizing material if not promptly taken up by plant roots is so soluble that it is soon washed through the porous sand by frequent rains and its accumulation is thus prevented.

CONDITIONS OF CLIMATE—STRONG WINDS.

The climate is a very singular one, and one of the chief difficulties in the way of rapid success in tree planting is the force and constancy of the winds, and the frequency of the gales. From the meteorological tables here given, prepared by Mr. W. T. Ellis from material kindly furnished by Mr. R. F. Stupart, Director of the Meteorological Service of Canada, covering nearly four years, it appears that the average hourly velocity of the wind during the whole of that period has been more than 18 miles, while the gales have averaged over 10 each month when the winds have ranged mostly from 40 to 65 miles an hour. A study of the temperatures will show that there are no extremes of heat or cold on the island; that the highest temperature during the past four years has been 78, and the lowest point reached by the thermometer during the same period was 5 above zero.

Months.	Maximum.	Minimum.	Total Precipitation.	Average hourly velocity of wind.	Maximum velocity.	Number of gales.	Fair.	Fog.
1898.	°	°	Inches.	Miles.		Days.	Days.	Days.
January	48·5	6·0	5·65	21·5	48	18	15	2
February	43·0	17·0	1·54	18·7	64	14	20	2
March	46·5	23·5	3·20	17·8	46	17	20	9
April	53·0	27·0	4·90	19·8	38	18	16	10
May	60·5	33·0	2·90	15·7	41	7	24	8
June	66·0	39·0	3·12	15·9	39	9	20	14
July	75·0	45·5	4·55	11·8	25	1	17	10
August	77·0	58·0	4·44	12·0	27	2	18	17
September	73·5	46·0	5.89	16·6	42	9	19	7
October	61·5	39·5	3·85	18·6	36	13	20	6
November	63·0	30·0	8·68	19·6	49	18	16	9
December	52·0	18·0	6·64	23·7	59	20	16	6
Averages	59·95	31·87	4·61	17·6	42·8	12	18	8
1899.								
January	48 5	7 5	2·17	24·4	53	21	19	3
February	39·0	9·0	2·78	26·0	65	19	17	6
March	47·5	17·0	4·96	22·6	46	20	22	13
April	48·0	29·0	1·65	19·5	56	13	22	12
May	59·0	28·0	2·62	18·2	39	10	21	7
June	64·5	41·0	4·97	12·8	27	3	16	11
July	71·0	52·0	2·30	14·9	31	5	22	21
August	74·5	56·0	3·76	12·6	32	2	20	2
September	72·0	48·0	3 52	16·0	40	7	20	8
October	69·0	44·0	5·71	16·8	46	9	22	6
November	59·5	32·0	2·66	20·0	56	12	18	8
December	53·0	24·0	4·31	18·8	49	18	17	6
Averages	58·79	32·29	3·45	18·5	45	12	19	8

Months.	Maximum.	Minimum.	Total Precipitation.	Average hourly velocity of wind.	Maximum velocity.	Number of gales.	Fair.	Fog.
1900.	°	°	Inches.	Miles.		Days.	Days.	Days.
January	52·5	17·0	5·76	23·7	56	20	14	5
February	52·0	7·0	3·59	26·5	56	20	17	3
March	48·5	15·5	6·15	22·2	52	19	16	8
April	52·5	32·5	5·55	19·4	46	16	14	6
May	57·8	34·0	3·04	16·2	37	6	19	7
June	69·0	40·0	2·84	14·2	27	6	21	14
July	75·0	49·0	2·25	13·4	32	3	23	18
August	73·0	51·0	6·16	13·6	40	4	17	6
September	70·0	47·0	5·66	16·2	49	7	17	8
October	66·0	37·0	2·31	17·4	51	11	21	5
November	60·5	27·0	2·94	22·7	46	24	11	8
December	49·0	20·0	2·94	21·8	52	15	14	3
Averages	60·48	31·41	4·09	18·9	45	12	17	7
1901.								
January	47·0	5·0	3·24	22·7	58	14	19	9
February	45·5	19·0	3·21	21·9	45	9	12	4
March	47·0	19·0	4·04	20·2	56	12	23	11
April	54·0	34·0	2·36	19·4	60	4	24	17
May	57·0	34.0	4·97	13·3	34	1	18	10
June	63·0	44·0	2·38	14·8	36	1	24	15
July	77·0	53·0	2·90	12·9	36	0	28	19
August	78·0	60·0	3·36	11·3	34	1	26	13
September	76·5	48·0	1·65	17·4	42	5	26	7
October	68·0	41·0	4·52	18·4	48	4	25	9
November	57·5	30·0	2·10	18·2	62	7	23	0
December	....	....	....	....	.....	....	.....	.....
Averages	60·95	35·18	3·17	17·3	46	5	22	10

PROGRESS OF THE WORK.

Letters have been received from the Superintendent every time an opportunity has occurred of sending one. As a rule the only communication the island has with the outside world is when a supply boat visits them, which is seldom more than three or four times a year. We left the island on the 23rd of May, and the first letter received bears date of 17th June, written in anticipation of the visit of the steamer as it did not reach me until July 12. Mr. Boutellier says: 'I feel that I can write to you now and give you all the particulars as to the planting, as we put in the last of the trees to-day at 4.30 p.m. There are about 200 to 300 planted at east end light, about 3,000 at No. 4 station, 1,000 at No. 2, and about 5,000 at No. 3 station, the balance were planted in what I have named Gourdeau Park. I managed to plough about nineteen-twentieths of the ground in this park, and there was about three inches of the black mould all over, and I was surprised at the even thickness of it as it varied very little in that respect. The pine and maple seed I also put in there to-day in ploughed ground, and then run a harrow over it lightly. I expect to have this ground all fenced before the end of the week with the wire and posts you brought over.

'I may say that almost everything planted seems to have taken root, those you first put in are budding freely, although I regret to say that on Friday last we had a moderate gale which lasted about 24 hours when the wind at times exceeded 40 miles an hour. I find that on the trees with soft leaves which had just opened, they were burned off as if from frost. The pines and spruces were not affected as far as could

be observed. For a week after I began the park plantation it was wet and foggy every day, and on the 2nd of June we had a wreck. The *Stella Maris*, of Granville, France, on the N.E. bar, our life boat went out but before we could reach the vessel the crew had abandoned the wreck and taken their own boats in which they came ashore. This was a temporary set back to the planting, but I employed three of the crew to help us, or I should not have finished the planting so soon. I am glad to have got them all in before the dry weather of July. I think it has been a favourable time, as we have had frequent and some heavy rains. Tree growing grows on one, and I hope that in the near future Gourdeau Park will be one of our show places. You can understand what interest I took in it when I ploughed over ten pounds of superfluous flesh off, and had a crick in the back several nights.'

SECOND REPORT.

The next letter was written on July 29, 1901, but in the interval Col. W. P. Anderson, Chief Engineer and General Supt. of Lighthouses, paid a visit to the island and took notes on the condition of the trees, and on his return to Ottawa kindly gave me an account of what he had seen and reported very favourably as to the general condition of the plantations. In Mr. Boutellier's letters, he says: 'Nearly a month has elapsed since Col. Anderson's visit, and yesterday I visited the plantations. I cannot give you close detail as to the many varieties, but can give you a general idea of the whole lot, and those that call for special mention. All the pines are growing, excepting a few. The white pine *P. strobus* can't stand the wind, but when sheltered grows freely. While the birches have leaved, they are feeble. Common juniper is a failure; Virginian juniper good. Maples, willows are growing and seem to do as well in the large plantations as in the nursery in the garden inclosure. Arbor vitae good. To generalize, I think the plantation at Gourdeau Park looks as well as the most practical enthusiast could expect. The small plantations at the other stations are doing about the same.

'The 50 lbs. of seed of maritime pine planted is up as thick as it can stand, and looks very fine and strong; they are standing the last few weeks well, which have been warm and dry. A few of the Manitoba maples are also up about two inches above the ground.

'In the garden plot there are some disappointments among the small lots. All the specimens of the following have died: *Betula alba laciniata,* four lots of honeysuckle, *Spiraea, Anthony Waterer ; Lilac Michael Buchner ; Retinospora filifera, Cornus sibirica variegata, Halesia tetraptera, Juniperus communis* and Cuthbert raspberry ; of some others a portion have died, but samples of each are left.

'The following are doing well and making good growth: Beach plum, *Pyrus prunifolia,* many of the currants and gooseberries, Golden Queen raspberry, blackberries, strawberries, roses, Siberian crab, *Acer platanoides, Ampelopsis quinquefolia, Berberis purpurea, Deutzia crenata, Bignonia grandiflora, Retinospora plumosa,* Hovey's arbor-vitæ, Columbian arbor-vitæ, also *Elwangeriana* and *Globosa, Amur privet, Euonymus Japonica* and *Lycium Europeum.* Of this I feel quite satisfied that if only one variety grows and succeeds nearly all the others may be grown under the shade or protection of that one. Shelter seems to be the desideratum. One dressing of the mixed fertilizers has been given, but it is too soon to expect results.'

THIRD LETTER.

The last communication was written on November 5. The Superintendent says : 'With regard to the condition of the trees the latter part of the summer was very dry, so much so that our vegetables are less than a half crop, so that you can see it must have been trying for the trees.

Rainfall—

June, 2·38 inches; spread well over the whole month; fogs as well.
July, 2·90 inches; spread well over the whole month; fair; warmer.
August 1 to 13, 3·36 inches; no fogs; very warm.
September 8 to 30, 1·65 inches; no fogs; very warm; dry gales.
October 3 to 24, 3·60 inches; no fogs; warm; some high winds.

'You will see from this that the trying time was from August 13 to October 3, with only 1·65 of rain, no fogs and very warm weather for Sable Island. The thermometer averaged high all summer.

'This drought killed most of the weaklings, and the high winds burned the leaves off the deciduous trees between September 21 and 26, during which time it blew a continuous gale from S.W. around to north. After the gale subsided, the leaves were as though a fire had run close to the trees and scorched them. It was not cold, and we have had no frost yet.

'Many of these trees were very promising, and some of them are budding again since we have had rains. We have had a fair amount of blooms from the roses which were much appreciated. We also had a sample of the strawberries. Many of the varieties made good growth, but we shall be able to judge better as to their permanent hardiness here next July.'

'Now, as I think I have shown you the worst side, I will show the other. All the evergreens looked dull during the drought, but after we had a few rains they improved wonderfully. All the pines, except the white pine *P. strobus* are looking splendidly and have made growth. The plants from the pine seed also grew well, but lately I noticed that many were turning a bluish cast. Some spruces survive, but few look promising. Arbor-vitæ suffered much from drought, but there are many promising specimens in various localities.'

'This general statement of the conditions of the trees applies to all planted in the various localities, but I think Gourdeau Park, 1½ miles east of main station, is most promising, and next is 4th station plot. In all plots planted the weeds and grass has grown freely, and I am satisfied now that this is best for the trees; it gives shelter. If the ground had been kept clear the drifting sand would abrade the bark, and it is very noticeable that trees do best where sheltered by grass or wild plants. In 'Gourdeau Park' there is shelter owing to the conformation of the ground, and the slopes have different exposures. I find where the slopes are exposed to the south-west and west winds (our prevailing winds) the trees are least promising.'

The experience thus far had covers too brief a period to permit of the forming of any decided opinion as to the ultimate success of this experiment in tree planting on Sable Island. It does, however, seem to me notwithstanding the unfavourable conditions that the outlook is promising. The work is most interesting and the outcome of it will be carefully watched and the results obtained recorded from time to time in our reports.

AGRICULTURAL AND HORTICULTURAL DISPLAYS AT THE GLASGOW EXHIBITION.

The immense resources of Canada as a food producing country and the important position which agriculture occupies here are not yet very well known in Great Britain, and one of the objects in view in the exhibit made in Glasgow was to bring before the visitors some practical evidences of these remarkable agricultural resources and of the great progress made in recent years towards their development. With the very large variety and abundance of material available at the Experimental Farms, the assistance of the Departments of Agriculture of the provinces and the kind co-operation of lead-

ing farmers in different parts of the Dominion there was brought together in the Canadian pavilion at Glasgow one of the finest collections of cereals ever made.

By instruction of the Hon. Minister of Agriculture, Mr. W. H. Hay, accountant of the Experimental Farms, was sent to Glasgow to put this material in place. His long experience with exhibitions in this country and the ability and artistic taste he has shown from time to time in the arrangement of the products of the Experimental Farms at exhibitions at home led to his being chosen to do similar work at the Paris Exposition in 1900. There he arranged an exhibit which was very much admired, but his work in Glasgow seems to have been an unusual triumph.

THE CANADIAN AGRICULTURAL TROPHY.

Mr. Hay in his report, says: 'The agricultural products were shown in the form of an immense trophy, situated in the centre of the building, which was erected in the form of an octagon with a circumference of 65 feet, and rose to a height of 35 feet. In front of four of the arches were placed open stands or shelving, and on these were displayed the threshed grain in bottles of many sizes and shapes. Each sample was carefully labelled with the name of the variety, and as far as practicable the place of origin and the yield per acre was given. The placing of the bottles in the arches permitted of their being seen to advantage and examined from all sides. The other four arches were left open and used as passage ways. The spaces between the arches were built up with pillars of grain forming an open square with a glass cylinder of grain in the centre.

'On the outside the lower part of the trophy was decorated with sheaves of grain and hundreds of bunches of grain and grasses. Higher up the grain was massed and arranged in gothic arches and in circles, and when completed the structure had the appearance of an immense temple of cereals. Coats of arms of the provinces were placed over each of the main arches, and some fine specimens of mounted "prairie chickens" were distributed among the sheaves of grain.

'In the centre of the trophy was a circular settee for the convenience of visitors who desired to rest, and above this was a glass case in which was shown samples of wool, flax, hops and leaf tobacco. From the ceiling of the trophy was suspended bunches of Indian corn in the ear, leaf tobacco and flax. Several large open urns with a capacity of about two bushels each were placed on convenient stands, and filled with choice red fife wheat. The desire for samples was so great that by the close of the first day the urns were nearly emptied of their contents. They were refilled, but in a day or two were almost empty again. As the supply available was not sufficient to continue this free distribution very long the urns were shortly filled with palms, shrubs and plants. A further supply of such decorative material was used with good effect at different points on the trophy. A large number of electric lights were arranged in the arches and circles so as to illuminate the whole trophy, and it was thus made to appear very attractive at night.

'A number of excellent photographs were displayed in convenient places about the trophy which interested the visitors very much. These included views of the Experimental Farms, fruit farms, scenes in connection with ranching, also with harvesting in Manitoba and the North-west Territories. Good views were also shown of settlers' homes, giving the appearance of the farm when first located, and again a few years later under improved conditions.

GOOD RESULTS FROM THE EFFORT.

'The results of the installation of the agricultural exhibits at Glasgow were very satisfactory. No other display of the sort could be compared with it, and the material was all in place before the opening day. The agricultural trophy elicited the admira-

tion of visitors on every hand for its colossal character, and for the great variety and high quality of the products of which it was constructed. Much of the material for this magnificent display was provided from the crops of the experimental farms, the branch farms at Brandon and Indian Head being the largest contributors. The straw of the samples of grain sent from the North-west was wonderfully clean and bright, and commanded the admiration of many of the old country farmers.'

THE CANADIAN FRUIT DISPLAY.

The display of fruit was also large and varied and highly creditable. This was in charge of Mr. Robert Hamilton, of Grenville, Que. Lists of the varieties of fruits deemed most desirable for showing in Glasgow were prepared by the writer when at the Paris Exposition in conference with Mr. A. McD. Allan and Mr. R. Hamilton. These lists were forwarded to Ottawa and the fruit was secured in good season. As soon as collected it was sent at once to cold storage in Montreal and from Montreal to cold storage in Glasgow early in the spring. On arrival in Glasgow the fruit was placed in cold storage there and taken out from time to time as required. When the packages were opened, the fruits, which were chiefly apples with a few pears, were found to be in excellent condition. The total supply sent was about 400 bushel boxes and five barrels. The number of varieties of apples shown at the opening of the exhibition was over 60, and included all the leading commercial sorts grown in nearly all the apple producing districts of the Dominion. The display of Canadian fruit was well maintained to the close of the exhibition, and at that time there were over 30 varieties in a good state of preservation. In connection with the exhibit of fresh fruit there was also an extensive collection of other sorts of Canadian fruits preserved in antiseptic fluids. These also were attractive in appearance and gave to the exhibit additional charms.

The fruit sent from Canada was practically the only good display of the sort at Glasgow, and was a constant source of wonder to the many thousands of visitors who daily gathered around the exhibition tables. These repeated exhibits of choice fruits at the large European exhibitions are doing much to dispel the mistaken ideas held—even by educated people—regarding the climate of Canada and at the same time have brought the excellent quality of Canadian apples prominently before a large number of European consumers. The notices given by the press were most flattering, and the excellence of Canadian food products was thus brought under the notice of a large number of people in Great Britain who were unable to be present at the exhibition.

SHOW OF CEREALS FROM THE HARVEST OF 1901.

Later in the season another collection of representative samples of Canadian grain was forwarded from the experimental farms at Brandon, Manitoba, and Indian Head, N.W.T., all fresh from the wonderful harvest of 1901. These were kept together and shown in a separate group, and assisted much in maintaining the interest in the Canadian display to the close of the exhibition.

THE PAN-AMERICAN EXPOSITION AT BUFFALO, N.Y.

A very complete and attractive exhibit of cereals and other agricultural products was prepared by the Experimental Farms for the Exposition at Buffalo. A commodious building was erected there by Canada, and this exhibit filled the greater part of the central court. The experimental farms all contributed to this display, but the greater portion of the material was supplied by the Central, Brandon and Indian Head farms. Grain in the straw was a prominent feature in this exhibit, and the large well-matured heads, with long bright straw especially of that from the farms at Brandon and Indian Head was much admired. Large collections of all the best varieties put

up in small bunches labelled and shown under glass formed a very instructive feature in this exhibit. There were also a large number of different sorts of cereals of very fine quality shown in glass jars tastefully arranged on stands. A good display was made of pease, beans, Indian corn, millets and many other agricultural products, including a good collection of the more important grasses of Canada, the latter put up under the supervision of Dr. Jas. Fletcher, Botanist of the Experimental Farms. The walls above the glass cases of grain in straw and grasses were panelled with various designs ingeniously worked out with different varieties of agricultural crops. These had a pleasing effect and were much admired. These designs were made at Ottawa by the farm foreman, Mr. John Fixter, and worked out under his supervision. He also put up a very fine display of honey produced at the apiary at the Central Farm which attracted much attention. I had the opportunity of visiting this exposition twice during the season, and found that the Canadian exhibit attracted a large number of visitors who were unstinted in their praise of the magnificent samples and high quality of the agricultural products shown.

REPORTS ON SOME JOURNEYS MADE.

It has been my pleasure to attend many important gatherings of farmers, fruit-growers and others during the past year, where I have had opportunities of giving addresses and of joining in the discussion of the subjects under consideration. It has been a matter of regret that the many pressing duties connected with my office have prevented me from accepting more of the kind invitations which have been received, and which under other circumstances I should gladly have responded to.

VISIT TO THE EXPERIMENTAL FARM, NAPPAN, N.S.

On my return journey from Sable Island I paid a visit to this farm, arriving May 24, when I carefully went over the different branches of work carried on there, and discussed future plans with the Superintendent with the object of making the work of this farm increasingly useful to the farmers of the maritime provinces. I found the stock in good condition. The recent additions to the barn accommodation will enable the Superintendent to enlarge his work in this direction, and the added conveniences will permit of the work being conducted to greater advantage.

The farm fields were in good order, but the season was backward and unfavourable, and the crops were not all in. Those which had been early sown were well up and looking healthy. An additional area of land had been cleared which will be gradually brought under cultivation. The general appearance of the farm and the condition of the buildings and stock showed evidences of careful management. Some useful additions have been made to the dairy herd by the recent importation of valuable animals from Great Britain. The flock of sheep has also been greatly improved during the year by disposing of the less desirable animals, and the addition of a number of pure bred Leicesters and Shropshires.

In the horticultural branch additions have been made to the varieties of fruit under test, and also to the collection of ornamental trees and shrubs. The group of perennial plants has been enlarged and additional supplies of flowering bulbs provided.

VISIT TO THE EXPERIMENTAL FARM AT BRANDON, MAN.

In journeying west on my annual tour of inspection of the Experimental Farms, I arrived in Brandon on August 16. Harvesting had begun, and during the two or three days previous had made rapid progress, and on many farms a considerable area

Canada's Agricultural Trophy at the Glasgow Exhibition.

was in stook. The weather was very fine and almost everything looked promising. The farm presented a neat and attractive appearance with its long, straight lines of experimental plots, on many of which the crops were now ripening. The cereals all looked well, excepting some of the oats which had suffered somewhat from rust. Indian corn was growing very fast and promised a heavy return, field roots were also progressing satisfactorily. Hay has been a very heavy crop ; the awnless brome grass and western rye grass have both done particularly well. The cattle in the pasture fields were in good condition, so also were the pigs and poultry. The buildings, implements and the grounds generally all bore evidence of good care. The crops have yielded well as will be seen from the annual report of Mr. S. A. Bedford, the superintendent. Some of the neighbouring farms were visited and most of those well worked promised crops about equal to those on the Experimental Farm.

Many of the trees in the Pyrus orchard had bloomed abundantly, but had been so injured by frost in June that there was very little crop. The plums had escaped injury from frost and the trees were well laden with fruit. Among these were a large number of new seedlings, none of which were ripe at that time, but on my return from the Pacific coast on the 12th September when I paid a second visit to Brandon, many of these varieties were ripe and proved of good quality. The small fruit plantations, the trees and shrubs in the arboretum and the hedges had all made satisfactory growth. The Dakota Cotton Wood *Populus deltoidea* which has until recently been a very promising tree on account of its thrifty and rapid growth has for two or three years past been seriously affected by a yellow rust on the leaves which has destroyed the foliage and so weakened the trees that many of them have been killed outright. This is a serious trouble which seems to be spreading fast in Manitoba, and it is doubtful if it is wise to plant this cottonwood to any great extent as a timber tree on account of its liability to this disease. The Russian poplars so far have been free from this trouble. Samples of the diseased leaves were forwarded to Dr. Jas. Fletcher, Botanist of the Experimental Farms, and in his portion of this report particulars will be found of some of the characteristics of this troublesome growth.

The flower beds about the buildings were full of bloom, and were much admired by visitors of which there were a goodly number every day.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

This farm was reached on August 19, when a careful examination was made of the crops, not only on the Experimental Farm, but on other farms in the district. Some of the grain had been cut, but the harvest was two or three days later than in Manitoba, and the yields were much heavier. The heads on some of the oat fields were so packed as to look from a little distance almost like a solid mass of grain. It was then estimated that some of the fields would give 100 bushels per acre. Wheat also has given larger crops than was expected. A perusal of the returns given by Mr. A. Mackay, superintendent, in his annual report appended, show most remarkable and unprecedented yields, and the neighbouring farmers have in many instances grown crops as large as those on the Experimental Farm. The hay crop has been unusually large. Indian corn gave very heavy returns, mangels and turnips also did well. The farm was found in its usual excellent condition, and reflected credit on the manager.

The crop of fruits was also heavy. A considerable number of the Siberian crabs, *Pyrus baccata* bore such abundant crops that the trees had to be propped up to prevent them from breaking. These fruit trees which have proven perfectly hardy wherever tested in the North-west bear fruits of varying size, on some trees they are very small, on others they are of good size, but they all make excellent jelly if properly treated.

The Making of Jelly from the fruit of Pyrus baccata.

Some of the varieties are astringent, and many experiments have been tried in Ottawa to ascertain the best method of treating these fruits to obtain jelly of high quality and free from astringency. These experiments were conducted by Dr. C. E. Saunders, who has prepared the following notes:—'In order to avoid unpleasant astringency in the jelly the following directions should be carefully carried out. Let the fruit be kept for some time after picking until it is thoroughly ripened. Take one quart of fruit, add about three pints of water, boil for about half an hour crushing the fruit when soft. Strain, first through a cullender and then once (or twice if a very clear product is desired) through a cloth. Heat the liquid to boiling ; add sugar and boil until it will set. This should take about ten minutes. The jelly should not be made very stiff. The amount of sugar to be added depends on whether a sweet or an acid jelly is desired. For a quart of fruit the quantity of granulated white sugar may vary from about a pound to two pounds. In the first case about one and one-quarter pints of jelly should be obtained, and in the second case a little more than a quart. The jelly from *Pyrus baccata* so made should be of a brilliant red colour and of high quality.'

A considerable number of these trees have been sent to settlers in different parts of the North-west during the past five years, and in some instances have now reached a bearing age.

A Disease Affecting Manitoba Maple Seed.

While visiting this farm my attention was called to a disease which has affected the crop of Manitoba maple seed this year, and which has practically destroyed it all through the Indian Head district and as far west as Pense. This disease affects, first, the ends of the wings of the seeds which dry up prematurely, and the disease extends from there to the seed itself. As the disease advances dark spots appear which show through on the seeds, and when these are torn open the interior is found to be dark coloured and empty. A sample of this diseased seed was sent to Dr. Jas. Fletcher, and in his report appended fuller reference is made regarding this new pest.

The plum trees at this farm also gave an abundant crop, and some of the varieties ripened well and were of good quality. The season was remarkable for the rapid growth of all sorts of forest and ornamental trees and shrubs. Flowers also did remarkably well.

VISIT TO REGINA AND PENSE.

A day was spent in examining the crops from Regina to Pense. The grain was found to be very heavy, and although the wheat was a little later in ripening than it was at Indian Head it matured well and was safely harvested before frost came. At Pense I visited the farm of Messrs. Spring-Rice, where I found very much to interest me. The crops were very fine and gave evidence of good farming, and the blocks of trees and shrubs were well cared for and making very excellent growth. A large proportion of these have been grown from young plants and seeds received from the experimental farms. Many interesting flowering shrubs and plants were also found here all in a thriving condition.

VISIT TO SOUTHERN ALBERTA.

From Medicine Hat a trip was made to Lethbridge and from there south along the line of the large irrigation canal recently constructed by the Canadian North-west Irrigation Company, known as the Galt Irrigation Canal, which draws water from an inexhaustible supply in lakes fed by the melted snows of the Rocky Mountains from

which flows the St. Mary's river. The length of the main canal is 61 miles, of the Lethbridge branch 32 miles, and of the Stirling branch 22 miles, making the entire length of this canal system, 115 miles. Water is now available for the irrigation of about 200,000 acres of land lying between the intake on the St. Mary's river—about five miles from the Montana boundary—to the town of Lethbridge. This great engineering work is likely to transform this section of country from one of comparative barrenness (for lack of necessary moisture) to one of great fertility.

Through the kindness of Mr. A. T. Galt, and of the manager of the Irrigation Works, Mr. C. A. Magrath, I was given facilities for seeing this remarkable work. Nine years ago I drove across a portion of this country it was then almost uninhabited, a few bands of cattle only, then ranged the plains, and the only settlement of any size was Cardston. This was a Mormon settlement, numbering then about 400. Since that time the population of the district has increased to fully 4,000 people, and the increase has been most striking during the past two years. About Lethbridge the settlement is of the usual character, and consists of a mixture of nationalities, but that lying south-east of what are known as the 'Rolling Hills' and extending to the Montana boundary is almost entirely Mormon.

GROWTH OF THE MORMON SETTLEMENT.

In addition to the thriving town of Cardston, which now has a population of 1,200, there are two other rapidly growing towns, Magrath and Stirling, both of which were started in 1899. Magrath has now about 600 people, and Stirling 550. At each of these new settlements there were about 2,000 acres under crop this year. At each place eight sections of land containing in all 5,120 acres, are inclosed with a common fence and within this all the crops of the community are protected from the inroads of stock. The houses of the settlers are well built, most of them being neat and comfortable with pleasant surroundings. The streets are wide, and each house has about an acre of land which in most instances is well cultivated with garden vegetables, flowers and small fruits. Evidences of industry and frugality were everywhere seen. The vice of drunkenness is scarcely known among the Mormons, a very large proportion of them being total abstainers. Further, a considerable number of them drink neither tea nor coffee, using only milk or water as they believe this practice to be healthier and find it also more economical.

Polygamy which is usually associated with Mormonism in the minds of most people, seems to be practically dead. It is said to be no longer a doctrine of the church, and as far as could be learned there was not the slightest evidence of such practice existing anywhere among the Mormons in Canada. They seem to be a law-abiding and industrious community, and their methods of co-operation are very helpful to the rapid progress of their settlements and the contentment of their people. In each settlement the head of each family is visited once a month by two of the leading men of the community, the wife also being visited at similar intervals by two of the leading women. During these friendly visits inquiries are made as to the health of the family and as to whether its supplies of food are sufficient, and when cases of suffering or want are discovered efforts are at once made to relieve them.

One of the funds available in the community for relief purposes is known as the 'Fast Fund.' Every family is said to have a fast day once a month, and on that day only one meal is eaten. The value of the other two meals is estimated and an equivalent sum given to the fast fund. This practice, it is alleged, does the fasters no harm, and provides a fund to which all contribute from which supplies can be drawn for the relief of the needy. By such methods much is done to bind each family to the community by bonds of sympathy and common interest.

A Proposed Beet Sugar Factory for Southern Alberta.

One of the wealthy men of Utah, Mr. Jesse Knight, who is reputed to have large revenues from mines in that state, takes a very active interest in the Mormon settlements of Alberta. He has recently purchased a large cattle ranch not far from the irrigated districts, of 100,000 acres for one of his sons, stocking it with 5,000 head of cattle, at a total cost of about $450,000. He has also bought another large tract of land on which to found a new town and settlement, adjacent to the irrigation canal, to be named after his other son, Raymond, where Mr. Knight is about to establish a large beet sugar factory. A party of surveyors were working on the open prairie laying out this town site at the time of my visit, contracts had been made for the ploughing of 3,000 acres of land to be completed before the end of the season, and a number of four-horse teams were then busily engaged in this work. Some of the pioneer settlers for this new town had already arrived, and in the meantime were living in tents. The 3,000 acres then being ploughed will be cropped with grain in 1902, and the following year will be in condition for the growing of sugar beets. Each farmer coming into the settlement will have eighty acres of land and will contract in his deed of purchase to grow not less than ten acres of sugar beets each year, and in this way an abundant supply of beets will be assured. Mr. Knight is an ardent prohibitionist, and is having a clause put in each of his deeds of sale providing that in case of the establishment at any time of any saloon or drinking place on any part of this property, such property shall be forfeited and revert to the original owner. It is expected that the beet sugar factory will be completed during the year 1902, and be ready to utilize the crop of 1903.

A DRIVE OVER THE FOOTHILLS OF THE ROCKIES.

Leaving Cardston a drive of fifty miles was taken over the rolling plains, which form the base of the foot-hill country, crossing the Blood Reserve and ending at the town of Pincher, which is situated on the line of railway through the Crow's Nest Pass. Many settlers are coming into this district, and the crops throughout this part of the country have been very encouraging. Notwithstanding its high elevation of from 3,000 to 3,500 feet the climate is such that fall wheat is grown in many localities quite successfully. This now forms an important crop, both at Cardston and Pincher, many of the farmers reaping from 30 to 40 bushels per acre. The variety chiefly grown at Cardston is a beardless red-chaff wheat known as Odessa; that grown at Pincher is a bearded wheat the name of which has been lost. In all these settlements the people are in the midst of a good ranching country where cattle live in the open during the winter and most of the residents own more or less stock.

THE GREAT COAL DISTRICTS.

After going through the Crow's Nest Pass a day was spent at Fernie, the centre of the great coal producing district, visiting the mines. The output of the mines there at that time was about 1,200 tons per day. A large proportion of this coal is made into coke which is used for the smelting of ores in the mining districts. Three hundred coke ovens were in operation at Fernie, and one hundred more were being built. At St. Michael, 25 miles east of Fernie; two hundred coke ovens were also in course of erection, and some fine seams of coal are being opened there. The supplies of coal in this part of the Dominion are so vast as to be practically inexhaustible.

VISIT TO THE EXPERIMENTAL FARM AT AGASSIZ, B.C.

Pursuing my journey westward I reached Agassiz, B.C., early in September. I found the crops of grain at the Experimental Farm very good. Wheat, barley and oats have all yielded well. The hay crop had been unusually heavy, and Indian corn, field roots and potatoes were very promising. Particulars of all these will be found in the report of the superintendent, Mr. Thomas A. Sharpe. The crops on the Experimental Farm may be taken as a fair index as to those on farms generally in the coast climate.

The fruit crop in the Fraser river valley in which the Experimental Farm is located, was disappointing. Cold and wet weather in the spring prevented much of the fruit from setting, so that there was comparatively few apples and pears. Later in the season rot prevailed in the plums to such an extent that a considerable proportion of this crop was destroyed. The fruit trees in the more newly planted orchards were making satisfactory progress. The trees in the nut orchard had made good growth, and considering their age were bearing well. The forest and ornamental trees were making rapid growth, and many of the shrubs and flowers blooming well. An additional area of land has been cleared to provide for increased pasturage and an enlargement of the orchards and to give additional areas for field crops in the near future.

The stock including the pure bred short-horns recently sent from Ontario were doing well, and the swine, sheep and fowls were all making satisfactory progress.

In the interior of British Columbia the fruit crop was said to be good and of excellent quality, but the limited time at my disposal prevented me from visiting any of these districts this year.

ACKNOWLEDGMENTS.

It gives me much pleasure to acknowledge gratefully my obligations to those who have rendered me special services. To the United States Department of Agriculture to whom I am indebted for a number of different sorts of cereals and other farm crops, to Dr. C. Doxrud, of the Technical School, of Christiania, Norway, for samples of cereals and other agricultural products grown in Norway. To the Director of the Royal Gardens, Kew, England, for seeds of trees, shrubs and plants from many countries, and to the Director of the Arnold Arboretum, Jamaica Plains, Mass., for seeds of promising shrubs. Also to Prof. John Macoun, Naturalist of the Geological and Natural History Survey, and Mr. J. M. Macoun, assistant naturalist, for seeds of interesting Canadian plants.

Acknowledgments are also due to the officers at the Central and Branch Experimental Farms, for faithful services rendered and for their earnest co-operation in carrying out the many lines of work planned.

My hearty thanks are also due to those members of the staff who have rendered me help in those branches of the work over which I have had personal charge; to the horticulturist, Mr. W. T. Macoun, who has supervised the labour given to the trees and shrubs, and to the lawns on the experimental grounds; to the farm foreman, Mr. John Fixter, who has carefully watched over the different branches of the work, has taken special charge of the experiments with fertilizers and made the notes thereon, he has also helped me much by many practical suggestions; to Mr. George Fixter, who has managed the work connected with the experimental plots of cereals, fodder crops and field roots, and has taken records of the growth and yield of all these, and has thus aided me much in furnishing material for the preparation of this report, to him I am also indebted for the careful management of the many details connected with the dis-

tribution of samples of seed grain, and to Mr. Wm. Ellis, who has done careful work in testing the vitality of seeds, in the management of the greenhouse plants, in the propagation of many useful and ornamental species and in the taking of the meteorological records.

I desire also to acknowledge the faithful services of my secretary, Mr. Malcolm O'Hanley, to whose energy and industry I owe much of the success which has attended my general work. The employees also of all the farms in every branch of work are deserving of mention since they have shown commendable care and have faithfully discharged their respective duties.

WM. SAUNDERS,
Director Experimental Farms.

REPORT OF THE HORTICULTURIST.

(W. T. MACOUN.)

WM. SAUNDERS, ESQ., LL.D.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit, herewith, the fifteenth annual report of this division. During the past year many experiments were made with trees, shrubs, herbaceous plants, fruits, and vegetables, and a large amount of useful data was obtained, but owing to the necessarily limited space available, only that which it seems most desirable to publish is given.

Character of Season.—Last winter was very unlike the previous one, for, while the weather during the winter of 1899-1900 was very changeable, that of 1900-1 was quite the contrary, and was noted for its long spells of cold weather. The winter set in very early, as snow fell on November 14, and remained. On account of this early fall of snow, and more following before very cold weather, the ground was protected from frost, and there was practically no frost in the ground all winter, a very unusual occurrence at Ottawa.

December was a cold month, the temperature falling to 18·8° F. below zero on the 10th. There was a considerable quantity of snow, and by Christmas there were fully 18 inches on the ground.

During the month of January there was very little mild weather, and no real thaw. The lowest temperature was on the 20th, when it was 25·5° F. below zero, which was the coldest day of the winter. During that month the snow increased in depth, and by the end of the month there were fully three feet on the ground. February was a very cold month, and the temperature did not rise above the freezing point from January 22 to March 2. While there were no heavy falls of snow in February, that which came remained. The snow did not apparently begin to get less until about the middle of March, and then it went slowly, as the weather was not warm, and it was very cloudy from March 21 to April 10. After April 1, the weather became considerably milder, and when it became bright on April 10, the snow was all gone except in the drifts. The heavy covering of snow all winter and the absence of frost in the ground afforded good conditions for the wintering of herbaceous plants, and such things came through well, the strawberries, especially, being in fine condition. There was, however, an unusual injury in the nursery among the young apple trees, as the bark of many of them was badly split within a foot of the ground. The trees grew until very late last autumn and the snow fell early on the unfrozen ground when the young trees were well charged with sap. The cause of the splitting was probably due to the fact that the snow prevented the frost from reaching the lower part of the trunk until very cold weather came, and then the severe frost caused the bark to burst.

Many ornamental trees and shrubs which have been quite hardy or nearly so in the past had a large amount of wood killed by winter. Fruit trees also suffered in their tops much more than usual, while raspberry canes were badly injured, and in consequence the crop was practically a failure in this district.

As there was no frost in the ground, it was only necessary to wait until the snow disappeared and the soil dried sufficiently to begin outside work. The first ploughing of the season was done in the orchard on April 12, and hand labour on April 8.

The spring continued very favourable for work, and there was scarcely any frost

after the early part of April. The warmest day in April was on the 28th, when the temperature was 79·8° F. Everything was well advanced by the middle of May, and at that time the season was fully a week earlier than in 1900. The warmest day of the month was on the 8th, when the temperature rose to 81·2° F.

There had been very little rain all spring, but beginning with May 10, there were few days on which it did not rain until after June 3. This long period of rainy weather had a bad effect on the setting of fruit, as the conditions for the fertilization of the flowers were very unfavourable. As a result, the crop of apples, plums, and grapes was much lighter than it would probably have been otherwise.

June was a warm month all the way through, and beginning with the 24th it was hot, the temperature rising to 96·8° F. on the 28th. This hot weather continued till July 2, when the heat moderated, but from July 12 to 18, there was another hot spell, the highest temperature of the year being recorded on the 16th, when it rose to 99° F. This hot weather lessened the strawberry crop considerably, and was very injurious to potatoes, except where there was thorough cultivation. August was also a warm month, but not as warm as July. September was mild to warm. The first frost, which was a very light one, occurred on the 20th, when the melon vines were injured, but tomatoes were not hurt. There was a very high wind on the 28th which blew off a great quantity of apples and blew down several trees. The weather was fine and mild in October and very favourable for fall work. The temperature did not fall below 30° F. until the 28th, when it went down to 27° F., killing the foliage of the grape vines. Up to this time such tender plants as Cannas had not been killed, and in sheltered places tomato vines were still green. The early part of November was also very favourable for outside work. On the 13th there was a heavy rain, which, freezing on the trees, weighed down the branches very much and many were broken, the cut-leaved birches suffering most of all. Four inches of snow fell on the 14th and remained, and winter may be said to have set in on that date.

Fruit Crop.—The season of 1901 was not, on the whole, a favourable one for fruit. Owing to very rainy weather during the blossoming season the apples, plums, and grapes did not set their fruit as well as usual, but there was not a good show of bloom on the apple trees from the outset, and the crop of this fruit was small, but of good quality. There was a fair crop of American plums, but the flower buds on the European varieties were winter killed, and hence there was no fruit from them. The pears had been so badly blighted in 1900 that there were few of the trees in condition to bear fruit, and hence there was practically none of that fruit. The flower buds of the cherries were killed by winter, and there was no crop. The raspberry crop throughout the Ottawa district was practically a failure, the canes having been badly injured by winter and in many cases killed outright. Although bent down at the experimental farm, for greater protection, they suffered badly, and there was a very light crop of this fruit. Strawberries came through the winter well and promised a very heavy crop, but hot, dry weather came during the ripening season which lessened it considerably, though the crop on the whole was good. The grapes ripened well, but owing to poor fertilization of the flowers the crop was light.

The potato crop, which was light in the Ottawa district, was good at the Farm. Tomatoes ripened well and there was a large crop this year. This was a favourable season also for tobacco, the yield being good, and most varieties were well matured.

PROGRESS OF THE WORK.

The work of the Horticultural Division continued to progress favourably this season, and most of the experiments undertaken in former years were carried on again.

During last winter a bulletin of 74 pages on Apple Culture was prepared by the Horticulturist and published in April, 1901. There has been a great demand for this bulletin, and it is hoped that it will prove useful to Canadian fruit-growers.

The top grafting of the more tender varieties of apples was continued again this year, though many of those grafted in the past suffered from blight in 1900 and were injured by frost last winter. There is still good evidence, however, of the value of top grafting some kinds which would not otherwise succeed here.

A seedling apple orchard was begun this season, and 494 trees planted, most of which had been grown from seed of apples ripened here. It is hoped that from these seedlings a productive, hardy, late-keeping dessert apple of good quality will be obtained, as such a variety is much needed here.

Many new varieties of apples were obtained from various sources, some of which were root grafted and others top grafted. The number of varieties in the orchard was also increased by young trees from the nursery.

The American plums are proving very useful in this district, and there is now a large collection of named varieties in the orchard. As they fruit, these are described and those found the most satisfactory recommended for planting. A large number of seedlings have been raised from some of the best sorts, and as they fruit they too are tested and described, and if found to be of inferior merit, discarded. A few sorts of great promise have already been obtained.

A new currant plantation was made last spring containing 111 varieties ; a strawberry plantation containing 218 varieties, and this autumn a raspberry plantation was made of 63 varieties.

Many experiments with vegetables were conducted this year, and the average results of some which have been carried on for five and six years obtained, which are very valuable as a guide to farmers and market gardeners. The List of Best Vegetables for Farmers, published in this report, gives in a concise form the conclusions reached regarding the merits of the different sorts.

Experiments in testing different varieties of tobacco were continued, and the crop was harvested in good condition and cured in the tobacco house. This was a favourable year for tobacco, it having ripened and cured well.

Measurements were again taken in the forest belts of the annual growth in height and circumference of the different kinds of timber trees, and new plantations were made where other trees had not succeeded.

The Arboretum never looked better than it did this year. Large additions were made to the collection of herbaceous perennials, and some new sorts of trees and shrubs were planted. Five hundred and twenty-five species and varieties were obtained last spring and planted in nursery rows and will be put in their permanent positions next spring. Notes were made again this year on the hardiness and growth of the different species and varieties.

As in the past, the correspondence has occupied considerable time, but this is one of the best means of conveying information obtained from the experiments conducted here direct to those who are most anxious to get it.

The experiments made with a lime mixture for the destruction of the oyster-shell bark-louse were continued last winter, and additional experience gained as to the value of this remedy. Bordeaux mixture and Paris green were used very faithfully in spraying for fungous diseases and biting insects, and the good results from these applications were, as a rule, very apparent. Other mixtures and solutions were used in smaller quantities.

Meetings attended and Places visited.—I had the pleasure of attending eight meetings during the past year, and while there endeavoured to be of as much service as possible to the farmers and fruit-growers with whom I came in contact.

At the meeting of the Nova Scotia Fruit Growers' Association, held at Wolfville, N.S., on January 28, 29 and 30, I gave an address on 'The Development of

Spraying in Canada,' and at the meetings of the Farmers' Associations, at Kentville, N.S., an address on 'Potato Culture.' From Nova Scotia, I went to Prince Edward Island, attending a special meeting of fruit-growers at Cardigan on February 5, and the meeting of the Farmers' Association at Middleton on the 8th. The meeting of the Prince Edward Island Fruit Growers' Association was held at Charlottetown on February 6 and 7, at which I gave an address on 'Apple Growing.' It was also my pleasure to attend the summer meeting of the Quebec Pomological Society, held at Rivière du Loup, Que., on August 20 and 21, where I gave a lecture on 'Hardy Fruits.' On September 12 and 13, I was present at the meeting of the American Pomological Society at Buffalo, N.Y., and delivered an address on 'Orchard Renovation'; and at the meeting of the Ontario Fruit Growers' Association, held at Cobourg, Ont., on December 4, 5, and 6, I gave a talk on 'The American Plum.'

While at Buffalo, in September, I visited the Pan-American Exhibition and studied the fruit in the large collections there, and during the same absence from home I visited the Agricultural Experiment Station, at Geneva, N.Y., and the Experiment Station at Cornell University, Ithaca, N.Y., in order to learn something of the work being done at these stations and something which would be helpful in my work at Ottawa. Returning homewards, I visited several fruit farms in the Grimsby district and examined the trees and crops there. During the autumn, I also visited the orchards and nursery of the Trappist Fathers at Oka, P.Q., and found much of interest there. At the same time I visited the orchards of Mr. R. W. Shepherd, Como, P.Q., where there was much to be seen that will be useful to me.

Acknowledgments.—I have much pleasure in acknowledging, and am very grateful for, the many kindnesses shown me by fruit-growers both in Canada and the United States. Information which it was necessary to have, in order to do my work with greater accuracy, has been freely given by many fellow-workers, and I fully appreciate the value of such help. To the fruit-growers of Ontario and Quebec, who assisted me in getting the necessary data to compile the district apple lists for my bulletin on Apple Culture, I am particularly grateful, as the ready response to my inquiries made it possible to make the lists much more accurate than they would have been otherwise.

I again take the opportunity of acknowledging the services of Mr. J. F. Watson, secretary to the Horticultural division, whose knowledge of the work relieves me of much office work which he is thus able to do himself. Mr. H. Holz, the foreman, continues to superintend the outside work satisfactorily, and I am pleased to note the great interest he takes in it.

Donations.—The following donations were received during the year, and this opportunity is taken to gratefully acknowledge the same :—

DONATIONS.

Sender.	Donations.
Arboretum, Arnold, Jamaica Plain, Mass., U.S.	Seeds.
Beall, Thos., Lindsay, Ont..	Scions of late red apple.
Beach, Prof. S. A., Geneva, N.Y.	Grape cuttings.
Botanic Garden, Durban, South Africa	Seeds.
Botanic Garden, Madras, India	Seeds.
Brodie, R., Montreal, P.Q	Scions of a red Fameuse apple.
Cockburn, J. C., Gravenhurst, Ont	Scions of Nora, Minto, and Sally Brown apples.
Dempsey, W. H., Trenton, Ont	Samples of 44 varieties of fruit. Apple scions.
DeWolfe, M. G., Kentville, N.S	Bulbs.
Dupuis, Aug., Village des Aulnaies, Que	Tree and scions of Amaryllis plum, and seedling apple scions.
Fonthill Nurseries, Fonthill, Ont	Scions of 8 Japanese plums.
Guay, A. E., Ville Marie, Que	Currant cuttings.
Hamilton, Robert, Grenville, Que	Childs and Blair crab apple scions.
Hodgins, A. S., Osnabruck Centre, Ont..	Apple scions.

DONATIONS—*Concluded.*

Sender.	Donations.
Hutt, Prof. H. L., O.A.C., Guelph, Ont..........	24 plants of Irene and Jucunda strawberries.
Iowa Horticultural Society, Davenport, Ia......	Plum scions.
Jack, N. E., Chateauguay Basin, Que.	Scions of Cox's Orange Pippin apple.
Kerr, W. J., Renfrew, Ont.....................	50 plants Shaffer raspberry.
Knox, A., Chesterfield, Ont....................	Apple scions.
Lalonde, A., Isle Perrot, Que..................	Scions of unknown apple.
Lathe, H., Lacolle, Que........................	Apple scions.
Leonard, E., Cobourg, Ont......................	Scions of unknown apple.
Macoun, J. M., Geological Survey, Ottawa......	Seeds.
Matheson, Miss Joan, Perth, Ont....	Scions of Rufus apple.
McFarland, F. H., Hyde Park, Vt., U.S.........	Scions of Roseau, McLure Pippin, Russian, Baldwin, Aurora, and Corliss Red apples.
Royal Botanic Gardens, Kew, England..........	Collection of seeds.
Sears, F. W., Snow View Garden, via Naini Tal, N.W.P., India..........	100 nuts of *Juglans regia.*
Shepherd, R. W., Como, Que.....................	Scions of Early Joe and La Rochelle apples.
Stubbert, G. E., Little Pond, C.B., N.S.........	Apple scions.
Terrill, A. M., Picton, Ont......................	Seeds of Terrill's Early tomato.
Tuttle, A. G., Baraboo, Wis., U.S...............	Scions of Repka Malenka apple.
Van Fleet, Dr. W., Rural New Yorker, N. York.	*Rosa wichuriana hybrid.*
Walker, Jos., Strathroy, Ont....................	Scions of unknown apple.
Wallenshlager, C., New Edinburgh, Ont........	Scions of seedling apple.
Wilkins, O. F., Bridgebury, Ont................	Seedling grape cuttings.
Young, Charles, Richard's Landing, Ont........	Scions of seedling apple.

I have the honour to be, sir,

Your obedient servant,

W. T. MACOUN,

Horticulturist.

APPLES.

While there was practically no root-killing in the apple orchard last winter, trees died on account of the severe weather, evidently being weakened by blight in 1900. There was more injury to the tops of the trees than there has been for some years, probably due to long continued cold, dry weather, which caused more evaporation of moisture than the trees could stand.

Two trees each of Ben Davis and Stark, the former planted in 1890, and the latter in 1891, were killed outright, and two trees of Gano, planted in 1891, were much weakened. These are given as examples of comparatively hardy varieties which were affected by last winter. During the summer 17 trees were blown down and in nearly every case the trunk was rotten almost entirely through. These trees had all been planted since 1887. Every year a number of trees go in this way, and it is difficult to tell what is the real cause, as it is not restricted to the tenderer varieties, but even the so-called iron clads rot in this way. The orchard has suffered much in past years from blight and root-killing and many trees are affected with the so-called black heart, and all these combined weaken them very much. The trees on the whole, however, look healthy and have been improving in this respect from year to year. The Russian orchard, comprised mostly of varieties of Russian origin, looks particularly well, the trees being healthier than in the standard orchard.

The crop of apples was light this year. There was not a good show of bloom to begin with and the wet weather which occurred during the blossoming season was very unfavourable to the pollination of the flowers, the result being that comparatively few apples set. Varieties which had good crops on some trees were McMahon White, Wealthy, Patten's Greening, Duchess of Oldenburg, Haas, Cross, Longfield, and Salome.

There was little blight in the orchard this year, and the season was a favourable one for growth. The cover crop in a large part of the standard orchard was ploughed under on April 13, and after cultivating several times to kill sod, the ground was re-sown with common red clover at the rate of 12 lbs. per acre on June 4, which resulted in a good stand. The cover crop in all the Russian orchard was ploughed under on April 23, and the soil kept cultivated until July 29, when it was re-sown with clover, and there was a fine cover crop by autumn. In other parts of the standard orchard the clover was cut at intervals and allowed to rot, as has been the custom in previous years.

In the spring, 86 trees were planted in the apple orchards. Of these, 69 were to fill vacancies, and 19 were planted in an additional row which was made to the Russian orchard. The vacancies were caused by death and by the rooting up of trees of inferior varieties. The Tetofsky has not been found a profitable apple here, although the tree is very hardy. It is inclined to overbear, and the fruit is small and drops badly. In 1888, there were 40 trees planted of this variety, 27 of which were living last spring, and as the space was required for the testing of other kinds, 13 of these were removed.

During the past season the early varieties were sprayed three times, and the late varieties four times with Bordeaux mixture and Paris green, and the fruit was practically free from spot, though the Codling Moth did some injury. Last autumn 47 trees, which were more or less affected by the Oyster-shell Bark-louse, were sprayed with the lime mixture, and the results were very satisfactory, there being few scales left on the trees. The trunks of the trees and large branches were washed with the alkaline wash for the prevention of borers. This wash is made by reducing soft soap to the consistency of thick paint by the addition of a strong solution of washing soda in water, and is applied with a brush. Only two borers were found in about 1,200 trees, showing that the orchards are practically free from this insect.

Last winter was a very hard one on the young top grafted trees and some which had come through two winters without injury were killed outright. The blight of 1900 also had done much injury, both to the stocks and grafts, as a result there was a great set-back to this work. However, some varieties are doing well. The work was continued last spring and additional trees were grafted and others finished which had been begun in previous years.

SEEDLING APPLE ORCHARD.

Most of the named varieties of apples growing in America to-day were originated as seedlings. Our forefathers brought apple seeds with them from the old land and sowed them in this country. The young trees raised from these grew up and bore fruit, and occasionally a variety of merit would thus be produced, and then propagated. In later times chance seedlings grew up in the fence corners and other waste places, and these also bore fruit and added their quota of good sorts. From trees like these have originated such fine varieties as Northern Spy, Baldwin, Fameuse, McIntosh Red, and many others.

Of late years more systematic efforts have been made to originate new varieties from seed. But the varieties of really useful apples which have originated in this way have been very few indeed.

At the Central Experimental Farm at Ottawa, considerable work has been done in raising seedling apples, especially from seed of Russian varieties, but no kinds of great merit have yet been produced.

In the year 1890, an orchard was planted comprising about 3,000 trees grown from seed imported from E. Goegginger, Riga, Russia. The seed from which these were grown was said to have been taken from apples grown north of Riga, Russia. Of these there are now 898 remaining, the rest having been killed by blight or winter or removed on account of weak growth or inferior quality. These began to fruit in 1897, when about 50 trees bore. In 1898 there were 40 trees which fruited ; in 1899 there were 43 ; in 1900 there were 26, and in 1901 there were 18, making a total of 177 trees which have borne fruit. None of these apples are sufficiently promising to be worthy of special mention, but a few of them are as good as the majority of the named Russian varieties. Nearly all of them are summer apples.

As the Russian seedling trees had not produced any varieties of great merit (unless it be found that they are hardier than other kinds) it was decided to grow a large number of seedlings from the best varieties which had fruited at Ottawa, in order to try and obtain something good from them. Accordingly, seeds were sown in 1898, 1899 and 1900, and a large number of seedling apple trees raised from them, and this year 494 were planted out in the pear orchard, places being left for the permanent pear trees. The trees were planted 10 by 10 feet apart in most cases. The soil was kept thoroughly cultivated, and the young trees made thrifty growth. The trees were made up of the following :—79 seedlings of McIntosh Red, 65 Lawver, 63 Shiawassee Beauty, 53 Wealthy, 53 Swayzie Pomme Grise, 39 Scott's Winter, 39 Winter St. Lawrence, 26 Northern Spy, 25 American Golden Russet, 10 St. Lawrence, 9 Edgehill, 6 Gano, 5 Fameuse, 3 Salome, 1 Ribston Pippin, 1 Pewaukee, 17 miscellaneous (fruit not ripened here) ; total, 494.

In addition to these, the following hybrids, originated by Prof. John Craig, were planted :—5 Pyrus baccata, female, with Duchess of Oldenburg, male ; 8 Pyrus baccata, female, with Tetofsky, male ; 21 Pyrus baccata, female, with Martha, male ; a total of 34 trees.

SEEDLING APPLES.

Notwithstanding the poor crop of fruit this year, a number of seedlings were sent in for examination and description, among which were several of merit. It is always a pleasure to examine these fruits, and we trust that every year those who have new varieties will send them to the Horticulturist that he may compare them with other varieties.

Full descriptions are published of the most promising of those which were received :—

No. 203.—R. Hamilton, Grenville, Quebec. Apple seedling.—Size, medium to below, roundish, yellow, splashed and washed with deep red ; cavity deep, medium width ; basin deep, medium width, wrinkled ; stem short, slender ; calyx closed ; dots obscure ; skin thin but tough ; core, small ; flesh, white, crisp, very tender, juicy, tinged with red to core ; sub-acid, with a pleasant but peculiar flavour ; quality, good to very good ; season, December, January. Evidently a Fameuse seedling. Tested January 23, 1901.

No. 204.—Joshua Bull, East Farnham, Quebec. Apple seedling.—Above medium size, roundish to oblate, pale greenish yellow, splashed and washed with carmine ; cavity, medium depth, open ; basin, deep, medium width, wrinkled ; stem, medium length, slender ; calyx, closed ; dots, obscure ; skin, thin, moderately tender ; core, small ; flesh, white, tinged with red, tender, juicy ; mild sub-acid, with a pleasant flavour ; quality, good ; season, early October. Said to be a seedling raised by Joshua Bull, East Farnham, Que. Might prove useful if a good cropper. Tested October 15, 1901.

No. 205.—J. P. Jones, Echo Vale, Que. Apple seedling.—Large, roundish conical, pale greenish yellow, splashed and washed with carmine ; cavity, deep, medium

width, slightly russetted ; basin, medium depth and width, wrinkled ; stem, short, moderately stout ; calyx, closed ; dots, obscure ; skin, moderately thick, tough ; core, small ; flesh, dull white, tender, juicy ; sub-acid ; quality, good ; season, early winter. May be a desirable apple if tree is very hardy. Tested November 4, 1901.

No. 206.—A. Dupuis, Village des Aulnaies, Que. Apple seedling.—A medium sized, very productive apple of medium quality.

No. 207.—Thos. Armstrong, Springdale, Ont.—Stanleydale, apple seedling.—A large, pale yellow apple, lightly splashed with pink on sunny side ; quality, above medium ; season, evidently from mid to late September.

No. 208.—C. A. Cass, L'Orignal, Ont. Apple seedling.—Above medium size, roundish, pale yellow, almost covered with deep red, but a few patches only streaked with it ; cavity, deep, medium width ; basin, medium depth and width, wrinkled ; stem, medium length, moderately stout ; calyx, closed ; dots, moderately numerous, small, distinct, but not prominent, yellow ; bloom, rather heavy ; core, medium size ; flesh, white, tinged with red, crisp, juicy ; sub-acid, with a pleasant, Fameuse-like flavour ; quality, good ; season, probably early to mid September. A promising apple very much resembling Russell. Tested September 3, 1901.

No. 209.—Miss Joan Matheson, Perth, Ont.—Rufus, apple seedling.—Medium size, roundish conical, pale yellow, well washed with crimson ; cavity, narrow, medium depth, russetted ; basin, narrow, shallow, slightly wrinkled ; stem, short, slender ; calyx, closed ; dots, numerous, pale yellow, distinct ; bloom slight ; skin, moderately thick, tough ; core, small ; flesh, white, tinged with pink almost to core, juicy, tender ; sub-acid, pleasant flavour ; quality, good, almost very good ; season, mid-winter to late winter. Probably a seedling of Fameuse. Tested April 20, 1901.

No. 210.—E. Leonard, Cobourg, Ont.—Unknown apple.—Above medium size, roundish, conical, green, splashed and washed with deep red ; cavity, rather shallow, open ; basin, narrow, shallow, wrinkled ; calyx, medium size, closed ; dots, fairly numerous, pale, distinct, but not prominent ; skin, thick and tough ; core, medium size ; flesh, yellowish white, crisp, tender, juicy ; sprightly sub-acid, pleasant flavour ; quality, very good ; season, late winter.

No. 211.—T. W. Gibbs, Huntsville, Ont.—Apple seedling.—Above medium size, roundish conical, pale greenish yellow, splashed and washed with carmine ; cavity, medium depth and width ; basin, narrow, medium depth, slightly wrinkled ; stem, short, moderately stout ; calyx, closed ; dots, obscure ; skin, moderately thick, tough; core, medium ; flesh, white, tender, juicy ; sweet, pleasant flavour; quality, good for a sweet apple ; season, October. A good sweet apple for its season. Tested October 9, 1901.

No. 212.—C. Wallenshlager, New Edinburgh, Ont.—Large winter apple seedling.

Nos. 213 to 216.—Thos. Frankland, Stonewall, Man.—Maude, Laura, Myrtle, and Annie apples. All small apples which may prove valuable in Manitoba.

No. 217.—N. E. Jack, Chateauguay Basin, P.Q.—Norman, apple seedling.—Above medium to large, roundish, greenish yellow, well washed and splashed with deep red with a purplish tinge ; cavity, deep, medium width ; stem, short, moderately stout ; basin, narrow, medium depth, slightly wrinkled ; calyx, closed ; dots, small, yellow, moderately numerous, distinct ; skin, thick, moderately tough ; core, medium; flesh, yellow, juicy, rather coarse, mildly sub-acid ; quality, good ; season, mid-winter to late winter. A promising winter apple. This apple was partly described in the report of the Montreal Horticultural Society for 1883. It originated at Chateauguay Basin, P.Q., and was first brought to notice by the late Robt. Jack, of that place.

VARIETIES OF APPLES, NEW OR NOT WELL KNOWN IN ONTARIO AND QUEBEC.

For a number of years descriptions of apples have been published in the annual reports of the Horticulturist, most of which were of new or little known varieties. In a bulletin on Apple Culture, published this year, 53 kinds of apples were described, most of which were standard varieties. As there are so many new kinds continually appearing, it has been thought best to continue the work of describing the newer or not well known sorts.

Akin Red.—Fruit, oblate to roundish, slightly angular ; medium size ; cavity, medium depth to deep, open, sometimes irregular on one side ; stem, medium length, slender ; basin, medium depth and width, slightly wrinkled ; calyx, medium size, partly open ; colour, yellow, almost covered with bright rich red or crimson ; dots, numerous, yellow, district, not prominent ; skin, thin, moderately tough ; flesh, yellowish, crisp, juicy, very tender, melting ; core, medium ; mildly sub-acid, pleasant flavour ; quality, very good ; season, mid-winter to late winter. A very beautiful apple. Promising. Received from W. C. Reid, Belleville, Ont., and described January 8, 1901, also from W. H. Dempsey, Trenton, Ont., and described December 10, 1901.

Babbit.—Fruit, oblate, conic, angular, large ; cavity, deep, narrow, russetted ; stem, short, slender ; basin, narrow, medium depth, wrinkled ; calyx, medium size, open ; yellow, well washed and splashed with red with orange shade ; dots, few, yellow, distinct, but not prominent ; flesh, yellow, juicy, coarse, briskly sub-acid or acid, little character ; core, medium size ; quality, medium ; season, late winter. Grown at C. E. F.; described January 4, 1901.

Baraboo.—Fruit, roundish to oblate, large ; cavity, deep, narrow, slightly russetted, wrinkled ; stem, short, moderately stout ; basin, medium depth and width, slightly wrinkled ; calyx, closed ; pale greenish yellow, lightly splashed and streaked with bright purplish red (carmine) ; dots, fairly numerous, pale, indistinct ; skin, moderately thick, tender ; flesh, yellowish, crisp, juicy ; core, small ; briskly sub-acid ; quality, above medium ; season, early to mid-September. May be useful for season following Duchess, which it resembles somewhat. Grown at C. E. F. Described September 6, 1901.

Boiken.—Fruit, oblate, angular, large ; cavity, deep, open, slightly russetted at its base ; stem, short, slender ; basin, deep, medium width, slightly wrinkled ; calyx, large, open ; pale yellow with bright reddish pink blush ; dots, fairly numerous, distinct, prominent on blushed part ; skin, thick, tough ; flesh, yellowish, crisp, tender, juicy ; core, medium size, open ; briskly sub-acid, not high flavour ; quality, good ; season, late winter. Received from W. H. Dempsey, Trenton, Ont. Described December 8, 1900.

Downing's Winter Maiden's Blush.—Fruit, oblate, large ; cavity, medium depth and width ; stem, short, stout ; basin, deep, medium width, smooth ; calyx, closed ; yellow with a pink blush, handsome ; dots, moderately numerous, pale yellow ; skin, thick, tough ; flesh, yellowish, buttery, juicy ; core, medium size ; mildly sub-acid, pleasant flavour ; quality, good ; season, mid-winter. Received from W. H. Dempsey, Trenton, Ont. Described December 24, 1901.

Duffey's Seedling.—Fruit, oblong conical, above medium to medium ; cavity, medium depth, narrow ; stem, short, moderately stout ; basin, shallow to medium depth, medium width, wrinkled ; calyx, open ; yellow, well washed with deep red ; dots, fairly numerous, yellow, distinct, prominent ; skin, moderately thick, tender ; flesh, yellow, tender, rather coarse, moderately juicy ; core, medium size ; sub-acid,

peculiar flavour, spicey, not altogether pleasant ; quality, above medium ; season, late winter. A handsome apple and a good keeper. Received from W. H. Dempsey, Trenton, Ont. Described January 4, 1901.

Early Joe.—Fruit, oblate, medium size ; cavity, deep, open ; stem, short, stout ; basin, medium depth and width, smooth ; calyx closed ; yellow, well washed and splashed with bright red with a pink tinge ; dots, numerous, yellow, distinct, prominent ; skin, thin, tender; flesh, yellow, juicy, tender, melting ; core, small ; sub-acid, sprightly, pear-like, pleasant flavour ; quality, very good to best ; season, mid-September to late September. Specimens received from R. W. Shepherd, Como, Que. Described September 19, 1901. An old variety.

Edgehill.—Fruit, oblate, flattened, large to above medium size ; cavity, deep, medium width, russetted ; calyx, closed, or partly open ; stem, short, moderately stout ; basin, deep, open, to medium, almost smooth ; yellow, heavily splashed and washed with dark purplish red ; dots, yellow, moderately numerous, distinct ; skin, thick, tough ; flesh, white, tender, juicy ; core, small ; sub-acid, pleasant flavour, good ; quality, good ; season, early winter. This is a good dessert apple. The flavour is somewhat like St. Lawrence. Grown at C. E. F. Described November 11, 1901.

Fameuse Sucré.—Fruit, oblate, flattened, medium size ; cavity, open, deep ; stem, medium length, moderately stout ; basin, medium depth and width, wrinkled ; calyx, closed ; pale yellow almost entirely washed or splashed with crimson ; dots, moderately numerous, purple, indistinct ; skin, moderately thick, tough ; flesh, white, crisp, tender, juicy, Fameuse-like ; core, small ; mildly sub-acid, pleasant flavour ; quality, very good ; season, mid to late September. Very similar to Fameuse in character of flesh and somewhat in flavour. Colour of skin is also very similar to Fameuse. Specimens received from R. W. Shepherd, Como, Que. Described September 19, 1901. Mr. Shepherd is not certain whether this is true to name.

Hamilton.—Fruit, oblate, above medium to large ; cavity, deep, open, russetted ; stem, short, moderately stout ; basin, deep, open, slightly wrinkled, almost smooth ; calyx, open ; pale yellow with a pink blush ; dots, fairly numerous, indistinct ; skin, moderately thick, tender ; flesh, yellowish, tender, moderately juicy ; core, small ; sub-acid, pleasant flavour ; quality, good or almost good ; season, late October, November. Not attractive enough looking to be very promising. Grown at C. E. F. Described November 8, 1901.

Horn.—Fruit, roundish, below medium size ; cavity, medium depth and width ; stem, medium length, slender ; basin, shallow, open, almost smooth ; calyx, medium size, closed, or partly open ; skin, yellow, almost covered with deep crimson ; dots, fairly numerous, medium size, yellow, conspicuous ; skin, moderately thick, tough ; flesh, yellow, tinged with red, juicy, very tender ; core, medium ; sub-acid, medium ; quality, good ; season, early winter. A very handsome apple. Received from W. H. Dempsey, Trenton, Ont. Described November 10, 1900.

Jefferis.—Fruit, oblate, size, medium to above ; cavity, deep, open, slightly russetted ; stem, very short, slender ; basin, deep, open, smooth; calyx, open ; pale yellow splashed and washed with crimson ; dots, fairly numerous, yellow, distinct ; skin, moderately thick, moderately tender ; flesh, yellowish, tender, melting, juicy ; core, small ; mildly sub-acid, pleasant flavour, good ; quality, very good ; season, September to mid-October. A fine dessert apple. Received from W. H. Dempsey, Trenton, Ont. Described November 2, 1901. An old variety.

Kinnaird.—Fruit, roundish, prominently angular, above medium size ; cavity, medium depth and width ; stem, short, stout ; basin, medium depth and width, wrinkled ; calyx, medium size, open ; greenish yellow, well washed and splashed with

deep, dull red ; dots, few, obscure ; skin, thick, tough ; flesh, yellow, crisp, tender, moderately juicy ; core, small ; sub-acid, pleasant flavour ; quality, good ; season, mid-winter to late winter. Grown at C.E.F. Described January 8, 1901.

Rochelle.—Originated with R. W. Shepherd, Como, P.Q. Fruit, roundish, obtusely conical, large ; cavity, deep, medium width ; stem, short, moderately stout ; basin, deep, medium width ; calyx, open ; colour, yellow, well splashed and washed with bright purplish red ; dots, fairly numerous, yellow, distinct, but not prominent ; skin, moderately thick, moderately tender ; flesh, yellowish, crisp, firm, juicy ; core, small to medium ; sub-acid, pleasant flavour ; quality, good ; season, early to near mid-winter. A large, handsome apple. Specimens from W. H. Dempsey, Trenton, Ont., and from R. W. Shepherd, Como, P.Q. Described November 27, 1901. For further information regarding the origin of this variety, see report of the Horticulturist for 1896, where it is already described.

Milding.—Fruit, oblate, large ; cavity, medium depth and width, russetted ; stem, short, stout ; basin, medium depth, open, almost smooth, ; calyx, open ; greenish yellow, splashed and washed with purplish red mostly on sunny side ; dots, few, small, yellow, indistinct ; skin, thick, tough ; flesh, yellowish, crisp, juicy ; core, medium size, open ; sub-acid, pleasant flavour ; quality, good ; season, early winter. Received from W. H. Dempsey, Trenton, Ont. Described November 18, 1901.

Missouri Pippin.—Originated in Missouri. Fruit, roundish conic, somewhat angular, medium size ; cavity, deep, medium width ; stem, short, slender ; basin, narrow, medium depth, wrinkled ; calyx, small, partly open ; yellow, well splashed and washed with dep red ; dots, fairly numerous, small, yellow, distinct ; skin, thick, tough ; flesh, yellowish, crisp, moderately juicy, rather coarse ; core, small ; sub-acid, pleasant flavour ; quality, good ; season, late winter. Grown at C.E.F. Described December 24, 1901. A hardy variety which may prove useful in this country.

Okabena.—Fruit, oblate, above medium size ; cavity, deep, moderately open to open ; stem, short, to medium, moderately stout ; ; basin, deep, medium width, slightly wrinkled ; calyx, open ; greenish yellow, streaked, splashed and washed with purplish red mostly on sunny side ; dots, few, obscure ; skin, moderately thick, moderately tough ; flesh, yellowish, crisp, tender, rather coarse, juicy ; core, small ; briskly sub-acid ; quality, above medium ; season, late September to early October. Resembles Duchess somewhat in appearance and quality, but is a more oblate apple than Duchess. Grown at C.E.F. Described October 3, 1901.

Palouse.—Originated in Washington Territory. Fruit, roundish to oblate, above medium size ; cavity, deep, open ; stem, medium length, slender ; basin deep, medium width, smooth ; calyx, open ; yellow, well splashed and washed with deep orange red ; dots, fairly numerous, yellow, distinct ; skin, moderately thick, moderately tender ; flesh, yellow, crisp, juicy ; core, medium ; briskly sub-acid, sprightly ; quality, almost good ; season, early to mid-winter. A handsome apple. Flesh not fine grained enough to make a good dessert fruit. Received from W. H. Dempsey, Trenton, Ont. Described November 12, 1901.

Parlin's Beauty.—Fruit, roundish, ribbed (but not prominently), large ; cavity, deep, medium width, russetted ; stem, short, slender ; basin, deep, narrow ; calyx, small, closed ; pale yellow, splashed and washed with bright red, mostly on sunny side ; dots, few, pale yellow, distinct ; bloom, slight ; skin, moderately thick, tough ; flesh, white, juicy, very tender, melting ; core, small ; sub-acid, pleasant but not high flavour ; quality, very good ; season, November. This is a very handsome apple and promising for its season. Received from W. H. Dempsey, Trenton, Ont. Described November 5, 1900.

Patten's Duchess.—Fruit, oblate, above medium size ; cavity, deep, medium width, slightly russetted ; stem, short, slender to moderately stout ; basin, deep, open, slightly wrinkled ; calyx, closed ; colour, greenish yellow, splashed and washed with orange red, mostly on sunny side ; dots, few, large, white, prominent ; bloom, slight ; skin, moderately thick, moderately tender ; flesh, white, crisp, moderately juicy ; core, small ; sub-acid ; quality, above medium ; season, October. Not desirable in this district, as it is not as good as Wealthy. It is a handsome apple. Grown at C.E.F. Described October 15, 1901.

Patten's Greening.—Fruit, oblate, large ; cavity, deep, medium width, russetted ; stem, short ; basin, deep, medium width ; calyx, open, large ; pale yellow with traces of pale green, with a pink blush ; dots, moderately numerous, pale green, distinct ; bloom, slight ; skin, moderately thick ; flesh, yellow, juicy, tender, coarse ; core, small ; sub-acid ; quality, above medium ; season, October to mid-November. Grown at C.E.F. Described October 18, 1901.

Switzer.—Fruit, roundish to oblate, medium size ; cavity, narrow to medium, medium depth ; stem, short to medium, moderately stout ; basin, shallow, medium width, wrinkled ; calyx, closed ; pale yellow, almost white, well washed with bright red ; dots, few, pale, distinct, but not prominent ; bloom, slight ; skin, moderately thick, moderately tender ; flesh, white, crisp, tender, juicy ; core, small ; sub-acid, pleasant flavour ; quality, very good ; season, late August to early September. Not unlike Lowland Raspberry in many respects, but its season is later, and it is more acid, and the flesh is not as melting. Fruit is also not blotched with bright red. Promising. Grown at C.E.F. Described September 3, 1901.

Utter's Red.—Fruit, roundish, large ; cavity, deep, open ; stem, short, moderately stout ; basin, open, medium depth, wrinkled ; calyx, open or closed ; pale yellow, splashed and streaked with bright carmine, mostly on sunny side ; dots, few, indistinct ; skin, thick ; flesh, yellowish, crisp, tender, rather coarse, juicy ; core, medium size ; mildly sub-acid, pleasant flavour ; quality, good ; season, early to mid-winter. Too coarse an apple for a good dessert fruit. Received from W. H. Dempsey, Trenton, Ont. Described November 14, 1901.

Winter Banana.—Fruit, roundish, angular, medium size ; cavity, medium depth, open, slightly russetted ; stem, short, stout ; basin, shallow, open, slightly wrinkled ; calyx, open ; yellow, with a deep red blush ; dots, pale, obscure ; skin, thin, tender ; flesh, yellow, crisp, tender, juicy ; core, medium size, open ; mildly sub-acid, sprightly, good ; quality, very good ; season, mid-winter. Received from W. H. Dempsey, Trenton, Ont. Described January 5, 1901.

PEARS.

Many of the trees in the pear orchard were killed by blight in 1900 and others were badly injured, and although the disease was not as prevalent this year, trees which looked in fairly good health last autumn died in the spring, and it was found that they had been affected the previous year, though the disease had not shown. The only tree which fruited this year was a Bessemianka, which produced a few pears. A number of seedlings of the best varieties are being raised, and it is possible that something which is comparatively blight proof may be originated.

Following is a description of a seedling pear received from E. C. Beman, Newcastle, Ont. :—

No. 218.—E. C. Beman, Newcastle, Ont. Pear seedling.—Large, roundish to obovate, obtuse pyriform ; skin, greenish yellow with a faint bronze tinge on sunny side ; dots, numerous, russet, prominent ; stem, long, stout ; cavity, shallow, open ;

basin, medium depth and width, smooth ; flesh, yellowish, juicy, sweet, tender, melting ; core, small ; quality, good ; season, late October. Promising.

PLUMS.

There was little injury to the plum orchard by winter this year, as far as the wood of the trees was concerned, but the flower buds on the European varieties were all killed, there not being a single fruit of this type of plum. There were a few plums of the Japanese variety known as Botan, but this is of little value here. Some of the Miner type of plums yielded fairly well, but these seldom fruit heavily here. The Americana and Nigra varieties blossomed abundantly, and a number of kinds fruited heavily, but the crop was not an average one on these trees, as the weather during the blossoming season was wet and unfavourable for proper pollination.

There is no doubt that in the Ottawa district, and where the climate is similar, the main dependence must be on the Americana and Nigra plums. These varieties, though not equalling the European plums in richness and tenderness of skin, afford good substitutes where better kinds cannot be grown successfully. The Nigra, or native plum, is thinner in the skin than the Americana, but not as rich. The fruit is also usually badly affected by blight (*Cladosporium carpophilum,* V. Thumen), and unless thoroughly sprayed does not mature, the blight affecting it when it is nearly full grown, causing it to wither and fall to the ground before maturing. The Nigra plum is also more affected by curculio than the Americana, which lessens the crop very much.

The Americana plum is a heavy bearer of handsome plums which, though, as a rule, thick skinned, are handsome and of good quality, though sometimes astringent. During the past few years there have been many named varieties offered for sale and some of these are very good indeed, being much larger and richer than the older sorts.

This year, when there was an abundance of European plums on the market from Western Ontario, the Americana plums, grown at the Farm, sold readily for 50 cents per 12-lb. basket. A tree of Bixby plum, planted in 1893, gave a yield of 11½ gallons, which, at 50 cents for 12-lb. basket was $2.87 worth of fruit from that tree, and in a good season the yield would be much more. The following quotation from a recent letter received from Mr. Alex. Stewart, Hull, Que., a prominent fruit-grower in this vicinity, is evidence as to the esteem with which these plums are held by other growers. He writes :—'I have not fruited a very great number of Americana plums as yet, as my orchard is young, but I am very proud of some of those that I have fruited. Their hardiness, fine appearance, and good quality make them of great value to the fruit grower of Eastern Ontario, and the Ottawa Valley in particular. The best five I have fruited so far are as follows :—Hawkeye, Stoddard, Wolf, DeSoto, Wyant.

'I sold my plums in 10-lb. grape baskets at 40 cents per basket ; 20-lb. baskets of western plums sold for 65 cents per basket at the same time. People will pay a third more for the local fruit. I took eleven 10-lb. baskets of Hawkeye off one tree five years planted. That will pay well. There will be quite a few plums planted about Ottawa next spring. I have given lists of the best varieties to a number of people. In five years from now we will see some good plums about Ottawa, and we may thank the Experimental Farm for their introduction.'

Mr. H. C. Carstesen, Billings Bridge, Ont., who makes a specialty of the native plum, *Prunus nigra,* has also kindly furnished me with some information regarding his success with them. Mr. Carstesen's trees are practically all seedlings of his own raising, some being much better than others. The soil in which they are growing is a heavy clay loam. The trees are kept thoroughly sprayed with Bordeaux mixture to prevent blight. Mr. Carstesen now has between 300 and 400 trees in his orchard, but many of these are young. Some of his trees have yielded from four to five 10-quart

pails each. The following are some figures furnished by Mr. Carstesen of some of his sales.

1898, 79 pails, averaging 80 cents per pail.

1899, 71 pails, averaging 93 cents per pail.

1900, 177 pails, averaging 87 cents per pail.

1901, 149 pails, averaging 82 cents per pail.

Some of the best of the plums sold as high as $1 per pail. Mr. Carstesen could not obtain these prices if it were not that his plums are very early, as they begin to ripen the first week of August and come on the market when there is little competition with other plums. He says that he cannot supply the demand for them.

The following extracts from a letter received from Mr. C. H. Snow, Cummings Bridge, Ont., show that all growers are not favourably impressed with these plums :—

'I cannot give you any encouragement so far as these American plums are concerned. The older the trees grow, the more rotten and miserable they look, and it would take a man doing nothing else but bolting and propping them up. Where-ever there is a crotch limb, down it comes by its own weight only. The recent sleet and rain that formed on the trees about 10 days ago pretty nearly finished the best of mine ; in fact, some of the trees of DeSoto will break off at the stump like a clay pipe.

'Now, for the fruit. The astringency in the skin shows up remarkably well when preserved. You should be at the table sometimes and hear the remarks of my children when my wife brings out some Hawkeye plum preserve. There are plenty of our old Canadian plums better for preserves, and if the people would only spray them they would be all right, and so far as selling, they bring a better price per pail, coming in, as they do, the first week in August, before the *Prunus domestica* class are shipped in here. This lateness in ripening is a great drawback. It brings them in straight competition with Lombard, Damsons, Yellow Eggs, and Gages, when sold this year the complaint was that the women folks found the skin too thick. The price paid me for a 2-gallon basket, nearly a pail, was 35 cents. Some of my neighbours got 75 cents and $1 for common wild plums. Still, the price is all right and would pay at this figure if one could sell a large quantity, but the competition is too keen from a much better source, viz. : the European varieties. The varieties so far fruited with me are : Stoddard, Rockford, DeSoto, Hawkeye, Wolf, Weaver, 2 kinds, Black Hawk ; the best of these are Stoddard, Hawkeye, and Wolf.'

It is very true, as Mr. Snow writes, that the trees split easily, and this is a drawback to the Americana varieties which the Nigras or native plums do not suffer from, but if the present market for these plums continues, paying crops will be obtained before the trees are too badly split to produce fruit, and as the trees begin to bear when young they may be replaced. The skin of the Nigra, or Canadian wild plum, breaks up easier in canning and preserving than the Americana, but they are not as rich. The Cheney is one of the best of these. Many of the Americana plums are but slightly astringent when preserved. Hawkeye is one of the poorest for this purpose.

The following recipes for canning and preserving Americana plums, published by Prof. E. S. Goff, in bulletin No. 87, of the Wisconsin Agricultural Experiment Station, Madison, Wis., will prove helpful to those who have not found the plums preserve well :—

'The native plums, especially those with firm pulp, after being treated by any of the methods mentioned below, are well adapted to all purposes for which the foreign plums are used. As a rule, more sugar is required for the native plums, but the preparations are rich in proportion. The harshness in the skin and stone of some native plums is readily removed by steaming them in an ordinary cooking steamer until the skin cracks ; or pour over them boiling water to which has been added common baking soda in the proportion of half a teaspoonful to a quart. The thicker-skinned

varieties may be readily peeled by placing them in boiling water two or three minutes. The recipes follow :—

'*Canning.*—Pick the fruit when well coloured but a little hard, steam or cook in a porcelain-lined kettle until tender, put in cans that have first been treated to boiling water, and cover with boiling syrup made of equal parts of granulated sugar and water, filling the can to the top ; then run a silver knife around the can inside and let out the air, and seal at once. Plums cooked in the syrup are likely to be tough. Canned plums may be used for pies and for mixing with or flavouring other fruits. Plums are often canned without sugar to be used in winter for making fresh plum butter. The juice of canned plums makes excellent jelly.' One lady recommends splitting native plums to the stone on one side before cooking, to avoid crumbling.

'*Drying.*—DeSoto, Wyant and doubtless other varieties may be pared, pitted, and spread on plates, lightly sprinkled with sugar and dried, first in the oven and later in the sun. Cook like dried peaches.

'*Plum Jelly.*—The fruit should be gathered when only part ripe—about half coloured. This point is very essential. Put plums in a large granite or porcelain kettle—the latter is best—with barely enough water to cover them. Cook until tender, but not until they are in a pulpy mass. Having previously covered a large jar with a cloth, strain the fruit in and let the juice drop through, but do not squeeze. When all has drained through, strain once or twice more through another cloth, until the juice is perfectly clear. To one measure of juice provide one measure of granulated sugar, but do not put together at once. A very important point in the making of all jelly is that only a small quantity should be cooked at one time. Into a medium sized kettle put, say, four tumblers of juice ; let it boil briskly 15 or 20 minutes, then add the four tumblers of sugar, and in a very short time—usually from three to ten minutes—the jelly will be finished, light, clear and delicious. To test the jelly, dip a spoon into the boiling juice and sugar and hold it up ; when the jelly clings to the spoon in thick drops, take it off quickly and put into jelly glasses. The plum pulp which is left can be put through a cullender and used for plum butter.'

'Another recipe :—*Plum Preserves.*—Take equal weights of fruit and sugar ; place in stone jar a layer of fruit, then a layer of sugar—alternating thus until quantity desired is reached. Let stand over night ; in the morning drain off the syrup that will have formed into a porcelain-lined kettle, place same over the fire and let syrup come to a boil ; then pour it over fruit in jar again ; repeat this every day until the fourth heating, when fruit and syrup are both put in kettle and boiled for a few minutes. Place same in glass jars while hot, seal and put away in some cool and preferably dark place.

'Still another recipe.—To each pound of plums add a pound of sugar ; put the fruit into boiling water until the skins will slip ; peel and sprinkle sugar upon each layer of fruit in a bowl, allowing them to stand over night ; then pour off the juice, bring quickly to a boil, skim and add the plums ; cook very slowly till tender and clear, which will take about one-half hour ; take them out carefully and put into a pan ; boil the syrup for a few minutes longer until it thickens ; pour it over the fruit; seal or tie them up.'

A better plum for this part of Canada will probably be obtained by crossing the Nigra with the Americana, as it is possible that a variety may be originated which will have the tough tree of the Nigra and the thinner skinned fruit of that species with the productiveness and freedom from disease of the Americana and the quality of that species.

The trees at the Experimental Farm are ten feet apart in the rows, the rows being 20 feet apart ; this greater distance being required in order that the trees may be thoroughly sprayed. Ten feet is a little too close in the rows, as the trees are already

interlacing, but this could not very well be avoided, as the original trees were planted 20 by 20 feet apart and the additional trees set half way between. A satisfactory distance would be about 15 feet apart each way, which would permit of thorough spraying for a long time. The trees, which are rather easily broken and split on account of the heavy crop they bear and the great growth they make when young, are better protected than if they were planted further apart.

In the report of the Horticulturist for 1900, a descriptive list was published of 13 of the best varieties of Nigra and Americana plums which had fruited at Ottawa, covering a season from August 24 to September 25. No new named varieties of special merit fruited this year, but among the young trees are a number of kinds which are spoken very highly of by those who have seen the fruit.

Seedling Plums.—Many seedling plums are being grown at the Experimental Farm, and a number of the Americana seedlings have already fruited. This year 54 trees bore, consisting of 12 Wolf, 7 Yosemite Purple, 6 Speer, 6 Weaver, 12 DeSoto, and 11 Rollingstone seedlings. Of these there were only three which were considered equal or superior to the best named varieties under test. These have been named and are herewith described :—

DON, *Wolf seedling.*—Planted in orchard, fall of 1895 ; tree hardy and vigorous ; fruit large, roundish ; suture a distinct line, not depressed ; colour uniformly deep, lively red all over ; dots numerous, small, yellow, distinct ; bloom moderately heavy ; flesh deep yellow, juicy, firm, with a sweet, rich flavour ; skin thick, and tough ; stone medium size, oval, somewhat flattened, cling ; quality, very good. Ripe September 28, 1901, and September 27, 1900. Thought to be the best late Americana plum yet fruited here.

CARO, *Wolf seedling.*—Planted in orchard fall of 1895 ; tree hardy and vigorous ; fruit very large, roundish ; suture fairly distinct, not depressed ; colour bright red, showing yellow in patches ; dots numerous, yellow, distinct ; bloom light ; flesh deep yellow, juicy, with a sweet, rich flavour ; skin thick, moderately tender ; stone large with an oval outline, but considerably flattened. Ripe September 6, 1901, and September 10, 1900. More attractive than Wolf and better in quality.

BOUNCER, *Yosemite Purple seedling.*—Planted in orchard fall of 1895 ; tree hardy and vigorous ; fruit very large, roundish ; suture a distinct line, not depressed ; colour a uniformly deep purplish red all over ; dots numerous, yellow, distinct ; bloom moderately heavy ; flesh deep yellow, juicy, with a sweet, rich flavour ; skin thick and tough ; stone large, flat, cling ; quality very good. Ripe September 10, 1901, and September 22, 1900.

A promising seedling plum of the *domestica* group named Amaryllis (No. 219) was received from Mr. Aug. Dupuis, Village des Aulnais, P.Q. It was a medium sized yellow plum of very good quality.

CHERRIES.

The cherry crop was a failure this year, the flower buds having been killed by winter. There has not been a full crop of cherries here since 1898, so that although the stocks and wood are hardy, the winters, as a rule, appear too severe for the fruit buds. The wood of the Morello cherries wintered well, as usual, but the Bigarreau, which are tender here, were killed nearly to the ground. The Dukes were not quite so badly affected, although they were much injured. The trees made good growth this year.

GRAPES.

The grape vines were uncovered on May 8, and it was found that they had wintered well. There was a fine show of bloom at blossoming time and it was thought that the crop would be a heavy one, but the wet weather which set in was very un-

favourable for pollination, the result being that there was only about half a crop on most varieties. The season was favourable for the maturing of the fruit, and 115 varieties ripened, although some of them were late in doing so, as the weather was not warm enough for rapid ripening. The vines were thoroughly sprayed with Bordeaux mixture during the growing season, and there was little disease of any kind.

The system of pruning and training now adopted is thought to be one of the most satisfactory where grapes are grown for dessert purposes and for home use, where the vines have to be protected. The system is a modification of that known as the High Renewal.

When a young vine is planted in the spring it is cut back to near the ground and after making the season's growth it is again cut back to one stem about 18 inches from the ground. Two canes only are allowed to grow during the second season, and when long enough these should be tied to the lowest wire, which should be from 18 inches to 24 inches above the ground. In the autumn the canes are bent down and covered with soil to protect the vine during the winter, the main stem also being covered. In the spring the canes or arms are spread out in opposite directions and tied along the lower wire, and three new wires should now be added 18 inches apart. This year being the third, there will be canes grow upwards from the buds along the outstretched arms, and a little fruit may set. During the growing season, laterals or side shoots should be pinched out. In the autumn of the third year the canes which have grown upright should be cut back to near the arms, leaving only one bud on each, in addition to the bud at its base, on the arm. The arms should, at the same time, be cut back until there are from 40 to 50 buds left in all, from which fruiting wood will grow during the fourth year. In the High Renewal system, provision is made for the replacing of the arms every year by new ones, by leaving two additional stubs on the main stem from which new canes grow and which replace the two arms. In this system the arms are never more than one year old. The system adopted at the Experimental Farm is between this and the horizontal arm system, where the arms are left for a number of years. It is found that if the arms are left permanently they will get stiff and are difficult to bend down and cover with soil, and in the High Renewal system there is danger of breaking one year old canes, and also danger from winter killing, in either of which cases the crop would be lost. Better results can be obtained by having the arms at least two years old, but not more than four, and they may be renewed in alternate years. The amount of wood left on the vines must be regulated by the earliness, productiveness and vigour of the variety. In most cases, 40 to 50 buds are sufficient to leave ; as a medium crop of well-grown, well-ripened grapes is better than a large crop of inferior fruit. By having the crop as near the ground as possible without the fruit being injured by the soil, the grapes will ripen better than if higher up, on account of the reflection of heat from the ground. When the vines are in full bearing, as they are in the fourth year, considerable pruning is necessary during the growing season. The vines are uncovered as soon as there is no further danger of severe frost and before the buds have swollen, about May 7 being the average time. The arms are then tied to the lower wire. In about a month afterwards it will be necessary to go through and tie the young shoots to the second wire and to pinch out unnecessary shoots, such as suckers and laterals. In about a week more they should be tied again and the laterals and suckers removed. Another pruning is necessary after the vines have grown above the top wire, when they are pinched back to that wire, and any other unnecessary shoots pinched out as before.

In the report of the Horticulturist for 1900, a list was published of the twenty-five earliest varieties which had fruited here, with descriptions and notes as to quality and dates of ripening, as the early varieties are the most useful in the colder parts of Canada. New kinds are continually being tested, in order to find out whether there are any others which are as early, and also to test their quality and productiveness. A large number of varieties recently planted were originated by T. V. Munson, of Texas, from whom they were procured.

Varieties of grapes planted in 1900 and 1901.—Atoka, Campbell's Early, Coleraine, Delago, Delawba, Early Daisy, Hosford, Lucile, Lukfata, Lutie, McPike, Manito, Marvina, Mills No. 9, Nectar, Norfolk, Presly, Storr's Early, Wapanuka, Yomago.—20 varieties.

RASPBERRIES.

The season of 1901 was very unfavourable for raspberries in this district. Owing to severe weather the canes were badly winter-killed; the Cuthbert, which is the principal variety planted, being so much injured that there was practically no fruit of that variety. Golden Queen appeared to be the tenderest, as there was not a cane left of this variety. A seedling originated by Mr. R. B. Whyte, Ottawa, Ont., now called Herbert, was quite hardy and it yielded the best at the farm this year. At the Experimental Farm the canes were bent down as usual, but it appeared to have no beneficial effect. In the following table the yields for both 1900 and 1901 are given. The yields this year show the relative hardiness of the varieties rather than their productiveness, some kinds not producing any fruit, and others very little.

RASPBERRIES—TEST OF VARIETIES.

Name of Variety.	Date of First Ripe Fruit.		Date of First Picking.		Date of Last Picking.		No. of Pickings.		Total Yield.				Length of Row.
	1900.	1901.	1900.	1901.	1900.	1901.	1900	1901	1900.		1901.		
Red Varieties.									Lbs.	Oz.	Lbs.	Oz.	Ft.
Kenyon	July 14	July 9	July 16	July 12	Aug. 13	July 30	12	7	32	2	3	1	36
Henry	" 4	" 5	" 13	" 9	" 6	" 18	11	3	28	1	0	15	36
Brighton	" 7	" 5	" 13	" 9	" 9	" 22	10	5	27	2	4	13	36
Clarke	" 11	" 6	" 13	" 9	" 13	Aug. 2	13	9	26	15	5	11½	36
Count	" 7	" 5	" 13	" 9	" 9	July 22	12	5	26	13	5	3	36
Marlboro	" 9	" 6	" 13	" 9	" 13	" 30	13	7	24	9	6	6½	36
Muriel	" 8	" 6	" 13	" 9	" 9	" 22	11	4	22	10	0	12	36
Phoenix	" 9	" 13	" 16	" 15	" 17	Aug. 6	13	8	21	0	9	1½	36
Boyle	" 9	" 6	" 16	" 9	" 9	July 24	10	6	20	1	3	8	36
Red Antwerp	" 11	" 6	" 13	" 9	" 9	" 22	11	5	16	12	2	12¼	36
Turner	" 11	" 9	" 13	" 12	" 13	Aug. 2	13	7	16	7	3	14	36
Dora	" 11	" 6	" 13	" 9	" 13	" 6	12	8	15	14	5	5	36
Reliance	" 7	" 6	" 13	" 9	" 13	July 30	13	8	15	13	2	6	36
Cassel	" 12	" 10	" 18	" 12	" 13	" 27	9	6	15	2	2	7	36
Garfield	" 11	" 7	" 16	" 9	" 13	" 22	12	5	15	2	3	11½	36
Lorne	" 7	" 6	" 13	" 9	" 13	" 15	12	3	14	11	1	8	36
Cardwell	" 10	" 10	" 16	" 12	" 9	" 27	10	6	14	11	2	10½	36
Nelson	" 11	" 6	" 13	" 9	" 9	" 15	11	3	14	3	1	2	36
Trusty	" 6	" 6	" 13	" 9	" 13	Aug. 2	12	9	13	7	3	4	36
Alma	" 11	" 6	" 13	" 12	" 13	July 22	12	4	12	15	1	8½	36
Thompson's E'ly Prolific	" 9	" 10	" 13	" 12	" 13	" 30	13	3	12	10	0	4	36
Hornet	" 11	" 6	" 16	" 9	" 13	" 30	11	7	12	5	2	2½	36
Cardinal	" 12	" 9	" 20	" 12	" 13	Aug. 2	9	8	12	4	12	7	36
King	" 7	" 6	" 13	" 9	" 17	" 2	14	9	11	3	6	0½	36
Craig	" 12	" 6	" 16	" 9	" 13	July 22	12	5	10	11	1	14¾	36
Cuthbert	" 15	....	" 20	....	" 17	....	11	....	10	11	.....		36
Loudon	" 12	July 12	" 16	July 12	" 17	July 30	13	7	10	10	2	6½	36
Hansell	" 6	" 6	" 13	" 9	" 13	" 22	13	5	10	9	1	2½	36
Heebner	" 12	....	" 18	....	" 13	....	11	....	10	6	.....		36
Herstine	" 12	July 20	" 18	July 22	" 9	Aug. 2	8	3	8	7	0	7	36
Biggar's Seedling	" 13	" 9	" 18	" 12	" 13	July 30	11	7	8	5	3	7½	36
Fontenay	" 12	....	" 16	....	" 17	....	11	....	7	5	.....		36
Miller's Seedling	" 9	July 16	" 13	July 18	" 13	July 22	13	2	7	1	0	4	36
Gladstone	" 7	....	" 13	....	" 27	....	6	....	6	9	.....		36
Deacon	" 12	July 6	" 18	July 9	" 9	July 18	9	4	5	10	1	11	36
Herbert	" 12	" 9	" 18	" 12	" 1	Aug. 6	5	9	5	6	17	2	36
Sir John	" 7	....	" 16	....	" 6	....	7	....	4	12	.....		36
Baumforth	" 9	July 5	" 13	July 9	" 6	Aug. 2	5	9	2	10	1	10½	36
Empire	" 6	" 6	" 13	" 9	July 18	July 15	3	3	2	9	0	6	36
Mary	" 16	" 6	" 18	" 9	" 25	" 15	4	3	2	5	0	12	36
Hiram	....	" 10	....	" 12	....	Aug. 6	...	9	.....		4	13¼	36
Sarah	....	" 20	....	" 22	....	" 6	...	6	....		2	10	36
Magnum Bonum	....	" 6	....	" 9	....	July 24	...	5	.....		1	11	36
Knevett's	....	" 6	....	" 9	....	" 12	...	2	.....		0	6	36

RASPBERRIES—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of First Ripe Fruit.		Date of First Picking.		Date of Last Picking.		No. of Pickings.		Total Yield.				Length of Row.
	1900.	1901.	1900.	1901.	1900.	1901.	1900	1901	1900.		1901.		
Yellow Varieties.									Lbs.	Ozs.	Lbs.	Ozs.	Ft.
Caroline	July 16	July 9	July 20	July 15	Aug. 16	Aug. 6	11	8	16	1	6	0	36
Yellow Antwerp	" 12	" 10	" 16	" 12	" 9	" 6	8	7	11	4	1	9½	36
Golden Queen	" 16	....	" 23	....	" 13	....	9	....	8	1	.....		36
Champlain	" 11	....	" 16	....	" 3	....	8	....	4	14	.....		36
Lady Anne	" 12	July 6	" 16	July 9	July 27	July 15	4	3	3	14	0	8	36
Purple Varieties.													
Shinn	July 12	July 9	July 13	July 9	Aug. 13	Aug. 6	13	10	27	8	16	12½	36
Duncan	" 14	" 10	" 18	" 12	" 13	" 6	10	8	18	15	4	13½	36
Shaffer	" 12	" 12	" 20	" 15	" 13	" 2	10	7	11	10	8	1	36
Ralph	" 16	" 16	" 20	" 18	" 9	July 22	8	2	8	7	0	4	36
Percy	" 10	" 9	" 16	" 12	" 6	Aug. 2	9	8	8	2	6	0½	36
Columbian	" 18	" 16	" 23	" 18	" 13	" 6	9	7	7	7	10	2½	36
RASPBERRIES GROWN IN LARGER PLOTS.													
Cuthbert (red)	....	....	July 18	July 18	Aug. 16	Aug. 6	12	6	92	7	7	0	236
Sarah "	....	....	" 20	" 22	" 13	" 6	9	6	67	7	23	11	236
Heebner "	....	....	" 18	....	" 16	....	12	....	43	2	......		236
Golden Queen (yellow)	....	....	" 20	....	" 16	....	11	....	45	8	......		236
Progress (black cap)	....	....	" 14	July 9	" 13	July 22	11	5	84	5	33	13	236
Hilborn "	....	....	" 18	" 12	" 13	" 24	12	5	71	14	31	7	236
Older "	....	....	" 15	" 12	" 9	" 22	10	4	47	3	25	1	236
Shaffer (purple raspberry)	....	....	" 18	" 12	" 16	Aug. 2	12	8	72	12	72	7½	236

STRAWBERRIES.

The strawberries wintered well this year and the prospects for a heavy crop were good, but during the ripening season there was very hot, dry weather which reduced the yield, although the crop on the whole was good. The advantage of thick foliage was very apparent this year, as such thin foliaged varieties as Clyde, though promising a large crop, had their fruit badly scalded and withered up. While varieties with thick foliage did not suffer nearly so much.

There were 350 varieties in the plantation, but of these 167 had been marked to discard in 1900, and the yields of them are not given. A new plantation was made in the spring of this year containing 218 varieties for comparison of yields and quality. In addition to these, three plants each of those which had been discarded, were planted, in order to keep in touch with them. No fruit was allowed to ripen on the new plantation this year.

In the following table will be found the yields of those varieties not discarded in 1900 with the yields for 1900 and 1901, and the average yields for the two years. In addition to this, other useful data are given regarding the different kinds. The crop recorded is from two rows each 15 feet in length. The rows were planted 3½ feet apart and the plants 15 inches apart in the rows. In 1899, when the plantation was made, the runners were kept pinched off until July, and in the spring of 1900 each row was cut back to 2 feet in width where necessary, and in the spring of 1901 the rows were again cut back to 2 feet. It is interesting to note that some kinds yielded better the first year than the second, one reason being that the varieties which make many runners are crowded the second season. On the other hand, some kinds which make few runners the first year yield better the second season when there are

more of them. The character of the season would also influence the yield. On the whole, the best practice is to take only one crop off, letting the runners start in time to get a good stand the year the plantation is made.

The names of the varieties in the table are in descending order of merit according to the yield of 1901. By examining the table it will be found that the six best yielding varieties, taking the average of 1900 and 1901, are Mele, Daisy, Buster, Howard's No. 41, Glen Mary, and Afton, all of which were described in the report for 1900, except Mele, which is a pale, soft berry of only medium quality and not recommended. In the table the letter P. stands for pistillate, or imperfect flowers, and B. for bisexual, or perfect flowers.

Name.	Bi-sexual, Pistillate.	Date of full bloom.	Date of first ripe fruit.	Date of first picking.	Date of last picking.	Number of pickings.	Weight of 25 average berries.	Total yield, 1900.		Total yield, 1901.		Average yield, 1900 and 1901.	
							Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Greenville	P	May 29	June 22	June 24	July 9	5	6½	10	11	35	11½	23	3¼
Mele	P	" 28	" 19	" 20	" 7	6	5½	22	3½	34	5	28	4¼
Bisel	P	" 28	" 18	" 19	" 12	7	6¼	8	11¼	33	3½	20	15⅜
Sample	P	" 29	" 20	" 21	" 12	7	7½	....		30	15		
Buster	P	" 29	" 22	" 25	" 9	5	8¼	20	8¾	30	12½	25	10⅝
Carrie	P	" 27	" 20	" 21	" 9	6	7½	5	9	29	15	17	12
Arkansas Traveller	B	" 28	" 18	" 20	" 7	6	5	9	10	29	10	19	10
Bubach	P	" 29	" 18	" 21	" 9	6	9¼	4	5	29	5¼	16	13⅛
Enhance	B	" 27	" 24	" 26	" 12	4	7	16	4	29	5	22	12½
World's Champion	B	" 28	" 22	" 24	" 8	5	5¼	7	2	29	2	18	2
Glen Mary	B	" 25	" 19	" 21	" 9	7	8	18	12	28	12¼	23	12⅛
Perfection	P	" 27	" 20	" 24	" 9	4	7¼	11	4¼	28	5	19	12⅝
Lloyd's Favorite	P	" 28	" 19	" 20	" 8	6	7½	6	0	26	10	16	5
Dora	P	" 29	" 20	" 24	" 12	6	6¼	15	4½	26	9¼	20	14⅞
Vories	B	" 29	" 22	" 24	" 8	5	5½	1	9	26	8½	14	0¾
Williams	B	" 28	" 21	" 24	" 5	5	6	15	7	26	4	20	13½
Beder Wood	B	" 23	" 17	" 19	" 5	6	7¼	7	13	25	5	16	9
Cole's Seedling	B	" 29	" 22	" 26	" 12	5	6½	....		25	0		
Howard's 41	P	" 27	" 18	" 21	" 9	6	6	25	2½	24	5½	24	12
Kyle	B	" 22	" 17	" 20	" 3	5	7	9	9	23	15½	16	12¼
Lincoln	P	" 25	" 15	" 17	" 8	7	6½	9	7¼	23	12	16	9⅝
Kansas Prolific	B	" 29	" 18	" 20	" 12	7	6	2	10½	23	11	13	2¾
Barton's Eclipse	P	" 27	" 21	" 24	" 9	5	5¾	7	6½	23	10½	15	8½
Daniel Boone	P	" 29	" 18	" 21	" 9	7	6½	10	8	23	9½	17	0¾
Hood River	...	" 29	" 19	" 20	" 8	6	13¼	4	9¼	23	9	14	1⅛
Dr. Arp	P	" 27	" 22	" 24	" 12	6	5½	9	9	23	8¼	16	8⅝
G. H. Caughell	B	" 25	" 18	" 19	" 3	6	5¼	10	4¾	23	3½	16	12⅛
Tennessee Prolific	B	" 27	" 18	" 20	" 12	6	8	4	4½	23	2	13	11¼
Enormous	P	" 29	" 19	" 24	" 8	5	6½	5	13	22	12½	14	4¾
Princess	P	" 27	" 18	" 19	" 9	7	8¼	3	9	22	11	13	2
Parker Earle	B	" 25	" 18	" 19	" 9	7	5¾	8	12½	22	10¾	15	11⅝
Sherman	B	" 25	" 18	" 19	" 9	8	9	6	12	22	7	14	9½
Maggie	P	" 23	" 18	" 22	" 3	4	5¼	19	8¼	22	3½	20	13⅞
Thompson's Late	P	" 29	" 24	" 25	" 9	5	4½	18	15½	22	2	20	8¾
Wonderful	P	" 29	" 21	" 22	" 5	5	6¼	22	1½	21	13	21	15¼
Gen. Putman	P	" 25	" 18	" 24	" 9	4	6¼	8	2	21	12	14	15
Lovett	B	" 27	" 19	" 21	" 8	6	7	6	5½	21	9½	13	15½
Logan	B	" 27	" 22	" 24	" 9	5	6½	6	13½	21	3½	14	0½
Hatch Exp. Station	B	" 29	" 22	" 24	" 8	4	5½	1	14	21	2½	11	8¼
No Name	B	" 27	" 20	" 21	" 2	4	6	15	9¾	21	1½	18	5⅝
Morgan's Favorite	B	" 27	" 22	" 24	" 9	5	8½	4	11	21	1	12	14
Nick Ohmer	B	" 25	" 22	" 24	" 8	5	7½	4	12½	20	7	12	9¾
Cyclone	P	" 25	" 18	" 19	" 12	7	5½	9	4	20	7	14	13½
Mattie Warfield	P	" 27	" 21	" 22	" 5	5	7¼	22	5½	20	6	21	5¾
Brandywine	B	" 27	" 22	" 25	" 12	6	6½	9	9½	20	1	14	13¼
Nehring's Gem	P	" 29	" 19	" 21	" 9	5	6	5	14¾	19	15½	12	15⅛
Sadie	B	" 25	" 18	" 26	" 5	5	3½	4	5¾	19	15	12	2⅜
Ridgeway	B	" 29	" 22	" 24	" 12	7	5½	3	0½	19	12	11	6¼
Cameronian	B	" 28	" 20	" 21	" 9	6	8¼	6	2¼	19	8½	12	13⅜
Manwell	B	" 29	" 22	" 24	" 3	4	5¼	1	7½	19	3½	10	5½
Cobden Queen	P	" 29	" 19	" 20	" 3	5	5½	7	2½	18	14	13	0¼
World's Champion	B	" 28	" 22	" 24	" 12	6	5¼	....		18	9		
Daisy	P	" 25	" 18	" 22	" 8	5	7	33	2¼	18	6	25	12⅛

Name.	Bisexual Pistillate.	Date of full bloom.	Date of first ripe fruit.	Date of first picking.	Date of last picking.	Number of pickings.	Weight of 25 average berries.	Total yield, 1900.		Total yield, 1901.		Average yield, 1900 and 1901.	
							Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Anna Kennedy	P	May 29	June 17	June 19	July 5	6	5	7	10½	18	4	12	15¼
Anna Forest	P	″ 25	″ 18	″ 20	″ 3	4	7	5	7¾	17	15½	11	11⅝
Louis Gauthier	B	″ 28	″ 27	″ 29	″ 12	4	7½	4	11	17	15	11	5
Imp. Westbrook	P	″ 25	″ 18	″ 20	″ 3	5	5	2	11	17	11	10	3
Jucunda	B	″ 29	″ 22	″ 24	″ 5	5	8	4	7	17	10½	11	0¾
Wm. Belt	B	″ 27	″ 24	″ 25	″ 12	6	6½	1	12	17	10½	9	11¼
New Dominion	B	″ 29	″ 22	″ 25	″ 12	6	7¼	14	3¾	17	9½	15	14⅝
Stone's Early	P	″ 25	″ 17	″ 19	″ 5	6	4	19	4	17	6	18	5
Clyde	B	″ 25	″ 18	″ 19	″ 5	6	6½	10	8¾	17	3	13	13⅞
Phipen	B	″ 28	″ 22	″ 24	″ 8	5	4	...	....	17	0		
X 189	B	″ 25	″ 20	″ 21	″ 9	6	5½	7	1¾	16	14½	12	0⅛
Northern	B	″ 23	″ 15	″ 17	″ 5	7	5	11	11¼	16	12¾	14	4
Carleton	P	″ 27	″ 21	″ 22	″ 5	5	5¾	26	2	16	10½	21	6¼
Klickita	P	May 28	June 22	June 25	July 12	6	5¼	8	7½	16	4	12	5¾
Hattie Warfield	P	″ 23	″ 18	″ 19	″ 9	7	6½	15	9½	16	1	15	13¼
Sharpless Seedling	B	″ 29	″ 22	″ 25	″ 8	4	5½	....	....	15	11½	....	....
Lloyd	P	″ 28	″ 19	″ 20	″ 8	6	6	2	4	15	11	8	15½
Young's Seedling	B	″ 27	″ 18	″ 22	″ 5	5	5¼	13	8½	15	10½	14	9½
Mayflower	B	″ 22	″ 14	″ 17	June 26	4	4½	4	6	15	4½	9	13¼
Afton	P	″ 25	″ 18	″ 22	July 8	5	6½	31	6	15	4	23	5
Deveroux	B	″ 25	″ 22	″ 24	″ 8	5	7	....	....	15	3½	....	....
Sharpless	B	″ 27	″ 22	″ 25	″ 5	4	6½	5	10½	15	2	10	6¼
Starr	B	″ 28	″ 22	″ 24	″ 8	5	10½	4	11½	15	1	9	14¼
X 341	B	″ 27	″ 20	″ 21	″ 5	5	5½	6	15	14	15½	10	15¼
Hiawatha	B	″ 28	″ 22	″ 24	″ 8	5	6¾	4	1	14	15	9	8
Johnson's Early	B	″ 23	″ 17	″ 20	″ 8	6	6¼	3	8½	14	14	9	3¼
Judsonia	B	″ 29	″ 18	″ 19	″ 7	6	4¼	19	3¼	14	9¾	16	14½
Champion of England	B	″ 27	″ 22	″ 25	″ 9	5	5½	9	11½	14	6½	12	1
Surprise	....	″ 27	″ 24	″ 24	″ 5	4	7	7	13½	14	4¾	11	1⅛
Mrs. Cleveland	P	″ 25	″ 18	″ 22	″ 8	5	5½	10	14¼	14	0	12	7⅛
Howell's Seedling	B	″ 29	″ 22	″ 24	″ 8	5	5½	....	....	13	15	....	....
Scarlet Ball	P	″ 29	″ 24	″ 26	″ 12	5	6	5	5½	13	13½	9	9½
Winnie Warfield	P	″ 27	″ 24	″ 25	″ 8	4	7	7	7½	13	12¼	10	9⅞
Livingston	B	″ 27	″ 22	″ 25	″ 9	5	5¼	....	....	13	12	....	....
Beverly	B	″ 28	″ 22	″ 25	″ 12	6	6	1	12½	13	10¼	7	11⅜
Little's No. 7	B	″ 27	″ 22	″ 24	″ 8	5	5	....	....	13	10	....	....
Lady Rusk	P	″ 25	″ 18	″ 21	″ 12	6	7	11	1½	13	10	12	5¾
Ona	P	″ 23	″ 18	″ 19	″ 5	5	5	8	11½	13	9	11	2¼
Tubbs	B	″ 25	″ 18	″ 19	″ 3	5	6½	3	11½	13	2	8	6¾
Klondyke	B	″ 29	″ 24	″ 26	″ 8	4	5	3	15	13	1	8	8
Gandy	B	″ 31	″ 25	″ 27	″ 9	4	6¼	4	2½	13	0½	8	9½
Beede's No. 1	B	″ 28	″ 18	″ 20	″ 8	6	7½	1	8	12	15	7	3½
Sandoval	B	″ 27	″ 20	″ 21	″ 5	5	7½	8	9	12	15	10	12
Will Warfield	B	″ 29	″ 21	″ 25	″ 5	4	4½	11	14½	12	13½	12	6
Earliest	B	″ 25	″ 17	″ 20	June 29	4	5½	1	10	12	13½	7	3¾
Crockett's	B	″ 28	″ 18	″ 20	July 8	5	5	6	11½	12	11	9	11¼
Warfield	P	″ 25	″ 20	″ 22	″ 5	4	5¼	27	6½	12	10	20	0¼
Van Deman	B	″ 25	″ 14	″ 17	″ 5	7	4½	6	13½	12	9	9	11¼
X 119	B	″ 27	″ 19	″ 21	″ 9	6	7	....	....	11	13½	....	....
Satisfaction	B	″ 25	″ 18	″ 21	″ 5	5	4¼	15	2	11	13	13	7½
Gandy Belle	B	″ 27	″ 20	″ 21	″ 5	5	6½	6	14½	11	13	9	5¾
Kentucky	P	″ 29	″ 24	″ 26	″ 8	3	5½	2	2½	11	11	6	14¾
Marshall	B	″ 23	″ 18	″ 19	″ 12	7	9¼	4	7¾	11	9¼	8	0½
Staples	B	″ 23	″ 15	″ 17	″ 3	6	5½	12	11¾	11	8¾	12	2¼
Laxton's Noble	B	″ 27	″ 19	″ 20	″ 3	5	7½	....	....	11	7	....	....
Elba	B	″ 25	″ 15	″ 17	June 29	5	5	5	7½	11	6	8	6¾
Erie	P	″ 29	″ 24	″ 26	July 8	3	5	....	....	11	6	....	....
McKinley	B	″ 28	″ 22	″ 24	″ 3	4	6	2	7½	11	5½	6	14½
Crescent	P	″ 27	″ 18	″ 19	″ 5	6	4	9	14½	11	3	10	8¾
X 95	P	″ 25	″ 22	″ 25	″ 12	5	3	6	3½	10	12½	8	8
Steven's Early	P	″ 27	″ 18	″ 22	″ 3	4	6	28	5½	10	12	19	8¾
Swindle	P	″ 25	″ 20	″ 24	″ 9	3	5½	17	11¼	10	12	14	3⅝
Repeater	B	″ 27	″ 18	″ 19	″ 3	5	5¼	....	....	10	11	....	....
John Little	P	″ 25	″ 18	″ 19	″ 3	7	4	15	11	10	11	13	3
Saunders	B	″ 27	″ 20	″ 21	″ 5	5	5	7	1½	10	9	8	13¼
Haverland	P	″ 23	″ 17	″ 19	″ 5	6	8	11	5¾	10	8½	10	15⅛
Harville	B	″ 28	″ 19	″ 20	″ 8	6	5	1	12	10	6½	6	1¼
Edgar Queen	P	″ 27	″ 17	″ 19	″ 5	6	5¼	5	11½	10	6	8	0¾

Name.	Bisexual Pistillate.	Date of full bloom.	Date of first ripe fruit.	Date of first picking.	Date of last picking.	Number of pickings.	Weight of 25 average berries.	Total yield, 1900.		Total yield, 1901.		Average yield, 1900 and 1901.	
							Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Magoon	B	May 28	June 24	June 26	July 8	4	6	5	5	10	4	7	12½
Gladstone	B	" 28	" 22	" 24	" 5	4	7¼	2	11½	10	3	6	7¼
Excelsior	B	" 25	" 12	" 17	June 29	5	5	....		10	1	....	
King Worthy	B	" 28	" 22	" 24	July 8	5	5	....		10	1	....	
Bush Cluster	P	" 22	" 17	" 20	" 8	5	4½	10	1½	9	13½	9	15½
Snowball	B	" 25	" 18	" 19	" 5	5	7¾	7	7½	9	12¾	8	10⅛
Pennell	B	" 28	" 22	" 24	" 8	5	4	....		9	12	....	
Beauty	B	" 25	" 18	" 19	" 3	5	8	6	7½	9	9½	8	0½
Iowa Beauty	B	" 25	" 22	" 25	" 5	3	5	8	1	9	9	8	13
6 G	B	" 25	" 18	" 21	" 5	4	5¾	10	14¼	9	8½	10	3⅜
X 288	P	" 27	" 21	" 22	" 5	5	4¾	12	3½	9	8	10	13¾
Michel's Early	B	" 22	" 12	" 17	June 28	5	3½	4	7¾	9	7½	6	15⅝
Senator Dunlap	B	" 27	" 18	" 22	" 2	4	6	....		9	6	....	
Twilight	B	" 23	" 20	" 22	" 8	5	5¾	....		9	3½	....	
Bomba	P	" 28	" 18	" 20	June 26	3	6½	21	0¾	9	0	15	0⅜
Bouncer	B	" 27	" 20	" 20	July 3	4	8½	0	10½	8	15¾	4	13⅛
Timbrell	P	" 29	" 24	" 26	" 12	5	6	1	15½	8	9½	5	4½
Homestead	B	" 27	" 18	" 20	" 8	5	6	1	7	8	7½	4	15¼
Edgar	B	" 28	" 22	" 24	" 3	3	5¼	10	8	8	6	9	7
H. & H	P	" 23	" 14	" 17	" 3	5	4	2	6½	8	5½	5	6
Berlin	P	" 25	" 18	" 21	" 3	4	6	6	11¾	8	4	7	7⅞
Della	B	" 27	" 22	" 24	" 8	4	5½	0	11	8	4	4	7½
X 77	P	" 29	" 24	" 25	" 9	5	3½	8	6½	8	1	8	3¾
Jersey Market	P	" 29	" 18	" 20	" 8	5	5½	....		8	0	....	
Leamington	....	" 27	" 21	" 22	" 5	5	6½	....		7	15	....	
Seaford	P	" 28	" 18	" 21	" 3	4	7	11	5½	7	14½	9	10
Eleanor	B	" 23	" 15	" 17	" 5	7	5½	4	4	7	13¼	6	0⅝
Maximus	B	" 27	" 24	" 26	" 5	3	6½	1	14	7	13	4	13½
Osceola	B	" 22	" 14	" 17	" 3	6	3½	6	7¾	7	12¼	7	2
W. J. Bryan	B	" 23	" 20	" 22	" 8	5	6¼	....		7	10½	....	
Evans	B	" 29	" 18	" 20	" 3	5	5½	0	11	7	9	4	2
Greenville Seedling	B	" 27	" 18	" 19	" 5	5	5¼	8	9¼	7	6	7	15⅝
Hunn	P	" 29	" 30	July 2	" 12	4	7	1	12½	7	2	4	7¼
Banquet	B	" 27	" 18	June 21	" 3	4	7	7	13½	7	1	7	7¼
Cruse's No. 9	P	" 28	" 22	" 24	June 26	2	6½	10	0¼	7	1	8	8⅝
Rough Rider	B	" 29	" 22	" 24	July 3	4	5¼	....		7	0½	....	
Liddle	B	" 27	" 22	" 26	" 8	4	4½	....		7	0	....	
Boynton	P	" 25	" 17	" 19	June 25	3	5½	9	12	6	15	8	5½
Mrs. McDowell	....	" 29	" 22	" 25	July 9	5	7	....		6	15	....	
Jessie	B	" 23	" 18	" 19	" 8	6	5	2	1	6	11½	4	6¼
Little's No. 30	P	" 28	" 24	" 26	" 8	3	6	....		6	8	....	
Albert	B	" 31	" 27	July 3	" 12	3	6	....		6	7	....	
Darling	B	" 23	" 15	June 17	June 26	4	5½	2	6	6	6	4	6
Long Dark Seedling	B	" 27	" 21	" 22	July 2	4	6¼	9	3½	6	5½	7	12½
Early Canada	B	" 23	" 15	" 17	" 5	5	4	1	3½	6	4	3	11¾
St. Joseph	B	" 23	" 6	" 19	" 2	5	3½	3	3½	5	14	4	8¾
White Alpine	B	" 27	" 22	" 27	" 5	2	1¼	2	2	5	9	3	13½
Noble	B	" 25	" 22	" 24	June 29	3	6½	8	6¼	5	8	6	15⅛
Hill's Manchester	B	" 23	" 22	" 25	July 8	4	4	8	11	5	7½	7	1¼
Orange County	P	" 23	" 15	" 17	June 28	5	4¾	6	8½	5	4	5	14¼
Bennett	P	" 27	" 21	" 22	July 3	4	6	....		5	1½	....	
Sam Sperry	B	" 29	" 24	" 25	" 5	4	6	15	14¾	5	1	10	7⅞
Avery Seedling	P	" 25	" 18	" 20	June 29	4	5¼	1	5½	4	10	2	15¾
Emperor	B	" 25	" 20	" 21	" 26	3	6	....		4	6	....	
Woolverton	B	" 22	" 21	" 22	July 3	4	5	2	5½	4	3¼	3	4⅜
Oberholtzer No. 2.	P	" 27	" 24	" 25	" 5	4	5½	6	5	3	4¾	4	12⅞
Gardner	B	" 29	" 18	" 21	June 26	2	5	6	1½	3	2½	4	10
Cinda	B	" 29	" 22	" 24	July 3	4	4	0	14½	3	1	1	15¾
Effie May	B	" 23	" 18	" 20	June 26	3	5¾	3	12½	3	0¾	3	6⅝
Bismarck	B	" 27	" 17	" 20	" 29	4	4¼	....		2	15	....	
Great American	...	" 29	" 27	" 29	July 8	3	4½	....		2	15	....	
Eureka	B	" 25	" 18	" 19	" 5	5	4½	....		2	13½	....	
Pride of Cumberland	B	" 28	" 24	" 26	" 3	3	5½	....		2	12½	....	
Philip's Seedling	B	" 29	" 24	" 26	June 26	1	6	9	14	2	10	6	4
Holland's Glory	B	" 28	" 22	" 25	July 5	4	1¼	0	5	2	2	1	3½
Augusta Narcaise	B	" 27	" 24	" 26	. 3	2	5	....		1	15	....	
Leader	B	" 23	" 18	" 22	June 28	3	6¼	9	1	1	12	5	6½
Empress of India	B	" 29	" 25	" 27	July 9	4	5½	0	12½	1	10	1	3¼
Mytrott	B	" 27	" 18	" 20	June 29	4	....	....		0	12½	...	

SPRAYING.

Spraying has long passed the experimental stage and it should not now be necessary to draw the attention of fruit growers to the importance of it. There are, however, a large number who do not spray. The proof of the value of spraying may now be had on every side, and it seems strange that good fruit is allowed to become worthless by disease when if sprayed in time it would be free, or almost free, from it. This year when the crop of apples was light and the prices high, it was especially desirable to keep what there was clean, and where this was done nearly as much money was realized in some cases as there would have been in a good fruit year, while on the other hand those who did not spray got very little.

A spraying calendar was published by the Entomologist and the Horticulturist this year, in which formulas are given for the various mixtures and solutions, what they are used for, and the time to apply them. This may be had on application. In a bulletin on Apple Culture, published this year also, further particulars were given on the subject of spraying.

The recent discoveries of Prof. T. J. Burrill, of the Illinois Agricultural Experiment Station, have necessitated a change in the time of the first spraying for the apple spot fungus. He found that the disease did not winter on the twigs as was supposed, but on the fallen leaves. Hence, the early spraying which it was customary to make with copper sulphate and water was really of little value in preventing the spread of the apple spot. It will, therefore, be advisable, to make the first spraying with the ordinary Bordeaux mixture and Paris green just as the leaf buds are breaking, regulating the time so as to kill the tent caterpillars which hatch about that time. The early sprayings are the most important, their object being to prevent the germination of the spores which alight on the leaves, fruit and other parts of the tree. Once the disease begins to spread it is very difficult to check it. Thorough spraying is just as important with other fruits as it is with the apple.

EXPERIMENTS WITH LIME MIXTURES FOR THE ERADICATION OF THE OYSTER-SHELL BARK-LOUSE.

Experiments were continued last winter with lime mixtures for the eradication of the oyster-shell bark-louse, in order to discover the best formula to use. As very severe weather occurred before the experiments were completed, and continued for some time, there were not as many mixtures used as had been planned, but the results obtained were very interesting. In the following table will be found a record of the work done and the results. The degrees of infestation, in ascending order, were: 'very few scales,' 'a few scales,' 'slightly infested,' 'moderately infested,' (meaning the same as 'considerably,' as used in 1900), and 'badly infested.' The spraying was done in November and December, 1900, and in January, 1901. Where possible the second application was made as soon as the first was dry.

Formula Used. — Number of Times Sprayed.	Number of Trees Sprayed.	How Infested before Spraying, December, 1900, and January, 1901.	How Infested after Spraying, December, 1901.
2 lbs. lime, 1 gallon water; sprayed twice.	32	24 moderately; 8 badly.........	26 with very few scales; 3 with few scales; 3 slightly affected.
Sprayed 3 times........................	1	Badly..........	Slightly; but few scales on young wood.
1 lb. lime, 1 gallon water; sprayed twice.	3	All moderately..	A few scales on one and very few on two.
Sprayed 3 times	4	" ..	Two slightly; two with but few scales.
1 lb. lime, 1 gallon water, 3½ oz. salt; sprayed twice..........	4	" ..	Very few left on any of the trees.

CONCLUSIONS REACHED UP TO DECEMBER, 1901.

1. Lime slaked in water and sprayed on apple trees infested with the oyster-shell bark-louse has the effect of loosening the scales.

2. The scales, when loosened, are removed from the trees by rain, ice, wind, and probably by other means.

3. As the scales contain the eggs from which the young insects hatch about June 1, it is necessary, in order to get the best results, that the trees be sprayed as soon as possible after the leaves fall in autumn, so that the loosened scales may be exposed to the weather for a long time before the eggs hatch.

4. The lime appears to have no injurious effect on the eggs within the scales.

5. Lime used in various proportions in the several experiments had no apparent injurious effects on apple or peach trees. Even when the leaf buds were opening no injury occurred.

6. As the action of the lime seems to occur soon after the trees are sprayed, it is not necessary to use any substance other than water to help bind it to the tree. On the contrary, it would appear that such substances counterbalance the effects of the lime, for a time, by glueing the scales to the trees.

7. It is important to use good stone lime, which has not been air-slaked.

8. The most economical and satisfactory formula so far has been found to be, 1 lb. lime, 1 gallon water, and 3½ oz. salt, or for a barrel of mixture, 40 lbs. lime, 40 gallons water, 8 lbs. salt. This should be sprayed on the tree twice, the second application being made as soon as the first is dry. The same proportions of lime and water without the salt have given quite satisfactory results also, and the salt is not necessary, but when used the bark of the trees was cleaner and brighter.

9. It is necessary to make at least two applications, as those scales with which the mixture does not come in contact will not be effected by it, and it is not possible to do the work thoroughly with one spraying.

10. The bark of trees sprayed with the lime mixture is much brighter afterwards than on trees not sprayed, and it is possible that many fungous germs are destroyed.

ASPARAGUS RUST.

The asparagus rust, *Puccinia asparagi,* D.C., is a disease which has done much injury to asparagus in the United States during the past five years, and more recently it has effected that vegetable in Canada. This year it appeared at the Central Experimental Farm for the first time. The disease was introduced from Europe to the United States and came into prominence about 1896. It has already spread from the New England States to Kansas and north into Canada. The following description of the life history of the disease is quoted from bulletin No. 188 of the New York Agricultural Experiment Station, where extensive experiments have been carried on in combating it.

'The life history of the fungus which causes the disease is marked by three distinct stages, each ending in the production of a crop of spores from which new plants may spring. This profusion of spore-forms may account in a measure for the rapid spread of the disease.

The first stage of growth of the fungus usually passes unnoticed by the owners of infested asparagus fields ; for from the germination of the spores in the spring till the first fruiting in June, the entire plant is hidden deep in the tissues of its host ; and this fruit-bearing is accompanied by no such change in colour of the asparagus fields as marks the ripening of the second crop of spores. In this first stage, known as the 'spring form,' 'cluster-cup stage,' or, scientifically classified, as the 'acidial stage,' the spores break through the epidermis of the host plant in clusters of cup-shaped pustules. These cups are greenish-yellow at first but change to orange-yellow as they mature.

The summer stage follows this spring form, though the two may overlap, both stages existing at the same time in the same plant. The brown colour of the asparagus fields produced by the ripening spores of this second stage, the 'red rust' form, and the rapid spread of the disease at this time, cannot fail to attract attention to the fields affected. The spores from this stage discharge from slits in the asparagus stems, not from clusters of pustules, and are so numerous that they cover workmen and tools in the fields with a heavy coating like brick dust.

The third stage, known as the 'winter stage,' follows the one just described, either in the fall or even in the summer if the lessened vitality of its host plant betokens approaching death. It is by the spores of this stage that the fungus is carried over the winter, so Nature provides for their formation whenever the existence of the fungus is threatened by the death of the asparagus plant it infests. The third stage differs from the second only in the character of the spores. In the summer stage the spores are one-celled and thin-walled, while in the winter stage they are two-celled, thick-walled and of such a dark brown colour that the stage is known as the 'black rust.' Both summer and winter spores may often be found in the same slit in the asparagus stem.'

The drying up of the stems and foliage of the asparagus plants before the season's growth is made, weakens them very much and on this account the crop of young shoots the following spring is much lessened and becomes still less every year the disease affects the plants. Owing to its smooth leaves and stem, asparagus cannot be sprayed to advantage with Bordeaux mixture, as it runs off when applied. At Geneva a combination was made of a 'resin-lime' mixture and Bordeaux mixture, the stock solution of the former being made as follows :—

Pulverized resin	5 lbs.
Concentrated lye	1 lb.
Fish oil or any cheap animal oil, except tallow	1 pint
Water	5 galls.

'It takes about two hours to prepare this mixture. The oil, resin and one gallon of hot water should be placed in an iron kettle and heated until the resin is softened, after which the solution of concentrated lye, or potash, should be carefully added, and the mixture thoroughly stirred. After the lye has been added, add four more gallons of hot water and allow the whole mass to boil until the mixture will unite with cold water, making a clear, amber-coloured liquid. When through boiling if there is not five gallons of the mixture add water enough to make that quantity.'

Two pounds of this stock solution were added to the Bordeaux mixture before spraying. The following quotation gives the dates of spraying and the results obtained :—

'After the last cutting was made the brush was allowed to grow for four weeks, after which five sprayings were given, the first on July 28. Alternate rows were sprayed and left as checks. The rust showed on the unsprayed rows August 19, and by August 24 had spread to all parts of these rows. They were killed by September 10. The sprayed rows remained green until the middle of October, but it was only the growth made between July 1 and August 10 that survived the attacks of the rust until October 15 ; that is, a growth that was completed, hardened and thoroughly sprayed before the rust struck the bed. All the new sprouts which came up in the sprayed rows after the rust appeared in the field were destroyed.'

'The results proved that in the case of every unsprayed row the yield in 1900 was less than it was in 1899, the decrease on the seven rows being 179 pounds. On the sprayed rows, on the contrary, there was an equally constant gain in yield of from 11 to 22 pounds to the row, the total increase being 110 pounds.'

The results obtained at the New York Experiment Station prove that the disease can be lessened materially by spraying, and as the loss to asparagus growers in Canada is likely to be very great from it, something should be done at once to check it,

and the best remedy found so far is that just described. If spraying is not done the plants should be cut and burned to help prevent the spread of the disease, but if this is done early the plants are weakened and if done late the spores will have spread, so that the best practice is to spray.

No variety has yet been found to entirely resist this disease, although Palmetto and Argenteuil appear to be the least affected. Conover's Colossal is one of the most injured by it.

LIST OF BEST VEGETABLES FOR FARMERS.

As all the experiments which are conducted with vegetables cannot be published every year on account of want of space, a list of the varieties of all the principal kinds which have proved the most satisfactory after several years' tests was published in the reports for 1899 and 1900 under the heading 'List of best Vegetables for Farmers.' This gave in a concise form much valuable information as to the best varieties to plant and must have proved very helpful to those who studied it. As the annual reports are very liable to be mislaid during the year, and as one is apt to forget the name of a variety, it has been thought advisable to again publish this list with what changes another year's experience warrants making.

Asparagus.—Conover's Colossal is the best all-round variety, but this variety is more subject to rust than Palmetto or Argenteuil.

Beans.—Golden Wax or Wardwell's Kidney Wax, for early crop ; Early Refugee, for medium ; and Refugee or 1,000 to 1, for late crop, are the most satisfactory dwarf varieties. Asparagus (early) and Old Homestead are two of the best pole varieties.

Beets.—Egyptian Turnip, Eclipse and Bastian's Blood Turnip are three of the best varieties.

Borecole or Kale.—Dwarf Green Curled Scotch is the best.

Broccoli.—White Cape.

Brussels Sprouts.—Improved Dwarf is the most satisfactory.

Cabbage.—Early Jersey Wakefield (early), Succession (medium) ; Late Flat Dutch, Drumhead Savoy (late), Red Dutch (red), is a select list of the best varieties of cabbage.

Cauliflowers.—Extra Early Dwarf Erfurt and Early Snowball (early) ; and Large Late Algiers are among the best.

Carrots.—Chantenay and Guerande or Oxheart are two of the best carrots, but if a good extra early sort is required, the Early Scarlet Horn can be planted with advantage. It is a small variety.

Celery.—Golden Self-Blanching, Paris Golden Yellow, Improved White Plume, White Walnut (early) ; London Red, Perfection Heartwell, White Triumph (late) are among the best.

Corn.—Early Cory, Crosby's Early, Henderson's Metropolitan (early) ; Perry's Hybrid, Stabler's Early, Early Evergreen, and Black Mexican (medium); Stowell's Evergreen, Country Gentleman (late). In planting, the Country Gentleman should not be omitted, as it lengthens the season very considerably, and is of fine quality. Other promising sorts are Burbank's Early Maine, Early Fordhook (early) ; and Bonanza Sweet (late).

Cucumbers.—Peerless White Spine or White Spine, Cool and Crisp, and Giant Pera are three of the most satisfactory slicing varieties. Boston Pickling is a good pickling sort.

Burnet Grape, Showing Method of Pruning and Training.

Sprayed. Potatoes at C. E. F., Ottawa. September 25th, 1901. Unsprayed.

Egg Plants.—New York Improved and Long Purple succeed best.

Lettuce.—Black Seeded Simpson, New York (curled), Tennis Ball, Salamander and Golden Queen (cabbage) ; Trianon and Paris Cos lettuce make a good list.

Melons, Musk.—Long Island Beauty, Hackensack and Montreal Market, of the Nutmeg type, and Surprise, Christiana and Emerald Gem, of the other types, are all good.

Melons, Water.—Cole's Early, Imperial, Ice Cream, and Phinney's Early are early water melons of excellent quality.

Onions.—Yellow Globe Danvers and Large Red Wethersfield are two of the best onions in cultivation.

Parsnips.—Hollow Crown and Dobbie's Selected are both good sorts.

Parsley.—Double Curled is as good as any.

Peppers.—Cayenne, Cardinal, Chili and Golden Dawn are four of the best.

Pease.—Gregory's Surprise, Gradus, Nott's Elcelsior and Premium Gem (early) ; McLean's Advancer, Nott's New Perfection, Improved Stratagem and Heroine (medium). None of these are tall growing varieties. Juno (dwarf), Telephone, Startler (tall), (late). Excelsior is a promising second early sort.

Potatoes.—Extra Early : Early Ohio and Early Andes (pink), Bovee and Burpee's Extra Early (pink and white). Early : Everett and Rochester Rose (pink), Early Puritan (white). Medium : Carman No. 1 (white), Empire State (white). Late : Late Puritan (white), American Wonder (white), Rural Blush (pink).

Radishes.—Early : Rosy Gem, French Breakfast, Red Rocket (red) and Icicle (white). Late : White Strasburg, Long White Vienna. Winter : Long Black Spanish, Chinese Rose-coloured.

Rhubarb.—Linnæus and Victoria are the most satisfactory.

Salsify.—Long White is the best.

Spinach.—Victoria and Thick-leaved are the best.

Squash.—Early : White Bush Scalloped and Summer Crook Neck. Late : Hubbard.

Tomatoes.—Early : Sparks' Earliana, Canada Victor, Early Ruby and Dwarf Champion. Main Crop : Brinton's Best, Trophy, Matchless, and Baltimore Prize Taker.

There are many varieties of tomatoes which are almost equal in excellence and productiveness.

Turnips.—Early : Extra Early Milan and Red Top Strap Leaf. Swedes : Champion Purple Top, Skirving's Improved.

EXPERIMENTS WITH POTATOES.

The potato crop was light in the Ottawa Valley this year, owing to dry weather during the month of July, and to rot in the autumn. While the yields at the Experimental Farm are not as large as last year, they are good and there was little injury either from dry weather or from rot. The rot is seldom troublesome when the potatoes are planted in well drained, sandy loam soil, as they were here, and owing to thorough cultivation the crop was not reduced much by the dry weather.

There were 133 varieties tested in uniform plots this year, of which the Burnaby Mammoth produced the best crop, the yield being at the rate of 530 bushels 12 lbs. per acre. The poorest yield was 173 bushels 48 lbs. per acre, the difference in yield

between the best and poorest being 356 bushels 24 lbs. per acre, showing the great importance of planting the most productive varieties. The average yield per acre from all the varieties tested was 365 bushels 25 lbs., being 247 bushels 25 lbs. greater than the average for the province of Ontario for 1901, which was 118 bushels. This difference is greater, however, than it would be if the varieties had been grown by the acre instead of in small plots.

The potatoes were planted this year in the same sandy loam soil they occupied in 1900, as in the orchard inclosure this was the best place available for them. On April 22 and 23, however, the land was given a good dressing of well rotted manure, which was ploughed under on April 25. Just before planting time it was thoroughly incorporated with the soil by harrowing, twice with the disc harrow and once with the smoothing harrow. Drills were made 2½ feet apart and about 4 inches deep. The sets were of fairly uniform size and had at least three eyes with a good amount of flesh and were planted 1 foot apart. Each variety occupied one row 66 feet long. The sets were covered with the hand hoe to get as nearly uniform conditions as possible. The soil was harrowed once before the potatoes came up, to kill any weeds which had germinated, to level the ground, and to loosen the surface of it. The soil between the rows was kept cultivated until the vines met, but the latter were not hilled up. The vines were sprayed with Paris green to destroy the potato beetle, and 4 times with Bordeaux mixture to prevent blight and rot. The potatoes were planted on May 28 and dug on October 4.

POTATOES—Test of Varieties.

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
1	Burnaby Mammoth	Good	530	12	490	36	39	36	Pink and white.
2	Dreer's Standard	″	506	0	457	36	48	24	White.
3	Late Puritan	″	503	48	440	0	63	48	″
4	Early White Prize	″	501	36	435	36	66	0	″
5	I.X.L	″	492	48	422	24	70	24	Pink and white.
6	Uncle Sam	Good	484	0	462	0	22	0	White.
7	Burnaby Seedling	″	479	36	418	0	61	36	Pink and white.
8	Canadian Beauty	″	479	36	400	24	79	12	″
9	Sabean's Elephant	″	473	0	415	48	57	12	White.
10	Green Mountain	″	470	48	422	24	48	24	″
11	White Elephant		464	12	420	12	44	0	Pink and white.
12	Seattle	Medium	462	0	415	48	46	12	White.
13	Vick's Extra Early	Good	462	0	391	36	70	24	Pink and white.
14	Money Maker	″	459	48	387	12	72	36	White.
15	American Wonder	″	455	24	418	0	37	24	″
16	Holborn Abundance	Medium	453	12	396	0	57	12	″
17	Pearce		446	36	413	36	33	0	Pink and white.
18	Burpee's Extra Early	Good	446	36	376	12	70	24	″
19	Clay Rose	Medium	444	24	418	0	26	24	Pink.
20	Maggie Murphy	″	440	0	409	12	30	48	Bright pink.
21	Livingston's Banner	Good	437	48	398	12	39	36	White.
22	Troy Seedling	Medium	435	36	396	0	39	36	″
23	Early Puritan	Good	435	36	380	36	55	0	″
24	Mills Prize	″	433	24	400	24	33	0	″
25	Rural Blush	″	433	24	389	24	44	0	Pink.
26	Jubilee	″	429	0	407	0	22	0	Pink and white.
27	Rochester Rose	″	422	24	354	12	68	12	Pink.
28	McIntyre	Medium	420	12	389	24	30	48	White and purple.
29	Churchill Seedling		420	12	385	0	35	12	White.
30	Cambridge Russet	Good	420	12	363	0	57	12	″
31	Polaris	″	418	0	369	36	48	24	″
32	Early St. George	″	418	0	360	48	57	12	Pink and white.
33	Carman No. 1	″	415	48	369	36	46	12	White.
34	State of Maine	″	413	36	385	0	28	36	″
35	Great Divide	″	411	24	360	48	50	36	″
36	Vigorosa		411	24	343	12	68	12	Pink and white.

POTATOES—Test of Varieties—*Continued.*

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
37	Early Norther	Good	409	12	334	24	74	48	Pink.
38	Rawdon Rose	"	407	0	358	36	48	24	Pink and white.
39	Earliest of All	"	407	0	336	36	70	24	"
40	Enormous	"	402	36	380	36	22	0	White.
41	Vanier	Poor to medium	402	36	334	24	68	12	Red.
42	Dr. Maercher		402	36	297	0	105	36	White.
43	Quaker City		400	24	374	0	26	24	"
44	Brown's Rot Proof	Medium	398	12	347	36	50	36	Pink.
45	Early Harvest	Good	398	12	341	0	57	12	"
46	Irish Cobbler	"	396	0	365	12	30	48	White.
47	Burbank's Seedling	"	396	0	354	12	41	48	"
48	Early Sunrise	"	391	36	343	12	48	24	Pink.
49	Delaware	"	389	24	363	0	26	24	White.
50	Montana Bluff		389	24	356	24	33	0	White, bright pink eye.
51	Early Pride	Good	389	24	336	36	52	48	Pink.
52	Wonder of the World	"	389	24	334	24	55	0	Pink and white.
53	Red Rock		389	24	323	24	66	0	Red.
54	Everett	Good	385	0	312	24	72	36	Pink.
55	General Gordon	"	382	48	312	24	70	24	"
56	Early Elkinah		380	36	336	36	44	0	"
57	Dublin Prize		380	36	327	48	52	48	
58	Peachblow		378	24	338	48	39	36	White.
59	Reeves' Rose		376	12	321	12	55	0	Pink.
60	Country Gentleman		374	0	319	0	55	0	Pink and white.
61	Rose of the North		371	48	305	48	66	0	Pink.
62	Lees' Favourite	Good	369	36	321	12	48	24	"
63	New Queen	"	369	36	314	36	55	0	Pink and white.
64	American Giant	Medium	367	24	325	36	41	48	White.
65	Early Michigan		367	24	323	24	44	0	"
66	Sir Walter Raleigh		365	12	338	48	26	24	"
67	Seedling No. 7	Medium	365	12	334	24	30	48	Bright pink.
68	Flemish Beauty Seedling	Poor	365	12	319	0	46	12	"
69	Champion		360	48	294	48	66	0	White.
70	Seedling No. 230	Medium	360	48	314	36	46	12	"
71	Mammoth Pearl		356	24	314	36	41	48	"
72	Rural No. 2	Good	354	12	332	12	22	0	"
73	Northern Spy	Poor	354	12	290	24	63	48	Bright pink.
74	Napoleon	Good	349	48	325	36	24	12	Pink.
75	Sharpe's Seedling	"	345	24	261	48	83	36	Pink and white.
76	Brosseau		343	12	316	48	26	24	Red and white.
77	Dakota Red	Medium	343	12	303	36	39	36	Red.
78	N. Bergeron		343	12	299	12	44	0	White, pink eye.
79	Dutch Blue		341	0	279	24	61	36	Dark purple.
80	Swiss Snowflake	Good	338	48	299	12	39	36	White.
81	Early Ohio	"	336	36	305	48	30	48	Pink.
82	Early Market		336	36	301	24	35	12	"
83	Irish Daisy	Good	336	36	292	36	44	0	White.
84	Pearce's Extra Early	"	336	36	286	0	50	36	Pink.
85	Early Rose	"	336	36	248	36	88	0	"
86	Bovee	"	334	24	281	36	52	48	Pink and white.
87	Early Summer		334	24	281	36	52	48	"
88	Early Andes	Good	334	24	253	0	81	24	Pink.
89	Dobson's Early		332	12	268	24	63	48	White.
90	Thorburn	Good	327	48	275	0	52	48	Pink and white.
91	20th Century		327	48	253	0	74	48	White.
92	Bliss Triumph		325	36	299	12	26	24	Red.
93	Early Dawn		325	36	297	0	28	36	Pink, brighter at seed end.
94	Prize Taker	Good	325	36	277	22	48	24	Pink.
95	Doherty's Seedling		323	24	299	12	24	12	White.
96	Livingston		323	24	294	48	28	36	White, pink eye.
97	Light Red Seedling		323	24	257	24	66	0	Pink.
98	Rose No. 9	Medium	321	12	290	24	30	48	"
99	Dark Red Seedling		321	12	286	0	35	12	Deep pink.

POTATOES—Test of Varieties—*Concluded.*

No.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Un-marketable.		Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
100	White Beauty	Good	319	0	281	36	37	24	White.
101	Rose of Erin		316	48	299	12	17	36	Pale pink, bright pink eye.
102	Chicago Market	Good	316	48	297	0	19	48	Pink.
103	Early Rose	"	316	48	228	48	88	0	"
104	Pearce's Prize Winner	"	314	36	246	24	68	12	"
105	Daisy	"	314	36	233	12	81	24	Pink and white.
106	Carman No. 3	"	312	24	294	48	17	36	White.
107	Columbus		310	12	270	36	39	36	Pink and white.
108	Ohio Junior		308	0	283	48	24	12	Pink.
109	Empire State	Good	308	0	281	36	26	24	White.
110	Silver Dollar		308	0	259	36	48	24	"
111	Penn. Manor		305	48	222	12	83	36	Pink and white.
112	Early Six Weeks	Good	303	36	286	0	17	36	Pink.
113	Gem of Aroostook	"	301	24	275	0	26	24	Pink and white.
114	Beauty of Hebron	Medium	294	48	250	48	44	0	"
115	Hale's Champion	Poor	294	24	248	36	41	48	White.
116	Pink Eye		290	24	246	24	44	0	White, bright pink eye.
117	Maule's Thoroughbred		290	24	242	0	48	24	Pink.
118	Reading Giant	Poor	286	0	244	12	41	48	"
119	Blue Potato		283	48	244	12	39	36	Deep purple.
120	White Giant		279	24	244	12	35	12	White.
121	Harvest King		275	0	248	36	26	24	"
122	Lizzie's Pride	Good	275	0	231	0	44	0	Pink, red eye.
123	New Variety No. 1	Poor	270	36	246	24	24	12	White.
124	Seedling No. 214	Good	264	0	228	48	35	12	"
125	Prolific Rose		264	0	226	36	37	24	Pink.
126	Bill Nye		253	0	162	48	90	12	White.
127	Seneca Queen	Very good	250	48	217	48	33	0	Pink and white, bright pink eye.
128	Clark's No. 1	Good	242	0	204	36	37	24	Pink.
129	Brownell's Winner	"	231	0	213	24	17	36	Red.
130	Houlton Rose		228	48	184	48	44	0	Pink.
131	Wall's Orange		226	36	204	36	22	0	Yellow, purple eye.
132	Up to Date		226	36	160	36	66	0	White.
133	Pride of the Market	Good	173	48	156	12	17	36	"

ADDITIONAL VARIETIES OF POTATOES TESTED IN 1901.

In addition to the varieties of potatoes grown in the uniform test plots, smaller quantities of the following varieties were planted :—

Name of Variety.	Number of Sets Planted.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable.		Colour.
		Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
Northern Beauty	33	422	24	378	24	44	..	
Pingree	33	422	24	316	48	105	36	
Dooley	33	400	24	334	24	66	..	
Early Envoy	33	334	24	268	24	66	..	
Wonderful	33	325	36	268	24	57	12	
California Cup	33	268	24	198	..	70	24	
Eureka Extra Early	33	210	33	188	46	21	47	

TWELVE BEST YIELDING VARIETIES OF POTATOES—AVERAGE OF SEVEN YEARS' TESTS.

Name of Variety.	Average Yield per Acre.		Name of Variety.	Average Yield per Acre.	
	Bush.	lbs.		Bush.	lbs.
1. Holborn Abundance	424	51	7. Dreer's Standard	373	34
2. Seattle	422	59	8. Everett	373	2
3. American Wonder	418	8	9. State of Maine	369	50
4. Late Puritan	406	1	10. Polaris	368	59
5. Seedling No. 230	388	8	11. Vanier	368	30
6. Burnaby Seedling	381	48	12. Empire State	368	15

This table was taken from Bulletin 39 prepared by Dr. Wm. Saunders.

POTATOES—PLANTING AT DIFFERENT DISTANCES APART.

For the past six years an experiment has been tried in planting the sets at different distances apart in the rows, the rows in each case being 2½ feet apart. The best average results have been obtained, so far, by planting the sets 14 inches apart, though the results from planting 12 inches apart are nearly the same. The yields of unmarketable potatoes in this test did not vary much except where the sets were planted 8 inches apart, but in this case there was a somewhat larger proportion of unmarketable potatoes than in the others. For the first four years of this test only one variety was used, but during the last two years two were planted and their average yield given. This year the varieties planted were Everett and Uncle Sam, an early and a late variety. The amount of seed per acre used may appear large, but from experiments conducted here it has been found advisable to use large sets.

Distances apart of Sets.	Seed required per acre.		Yield per acre, 1896.		Yield per acre, 1897.		Yield per acre, 1898.		Yield per acre. 1899.		Yield per acre, 1900.		Yield per acre, 1901.		Average Yield per acre, 6 years.		Average Yield per acre, after deducting seed.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
10 inches apart.	34	50	[illegible]	18	331		268	24	392	2	327	48	393	48	344	43	309	53
12 " ..	29	2	336	36	278	47	347	36	406	34	316	48	385		345	13	316	11
14 " ..	24	53	323	24	268	50	290	24	454	58	325	36	398	12	343	34	318	41
16 " ..	21	46	335	30	226	1	233	12	392	3	279	24	429		315	52	294	6
18 " ..	19	21	289	18	226	31	253		234	34	270	36	369	36	273	56	254	35

POTATOES—PLANTING AT DIFFERENT DEPTHS.

An experiment has been conducted during the past four years in planting potatoes at different depths in rows 2½ feet apart and 12 inches apart in the rows. The sets had at least three eyes each, and were about uniform in size. The soil was sandy loam, every year. Level cultivation was adopted, and thus very little soil was thrown on the potatoes after they were covered at the time of planting. The following table shows that the best yields were obtained from planting the sets only 1 inch deep. As the relative yields from the different depths of planting have not been the same every year, it will be necessary to continue this test for some time before accurate conclu-

sions can be drawn. Notes were taken on the depths at which tubers were formed in 1899, 1900 and 1901, and it was found that most of them were within 4 inches of the surface of the soil, even where the sets had ben planted 6, 7 and 8 inches deep. Where the sets were planted less than 4 inches deep nearly all the tubers were formed between that and the surface of the soil. Two varieties, the Sir Walter Raleigh and Empire State, were used in the test this year, and the average results from them are given as the yields for 1901. There are several reasons why the potatoes planted from 1 to 3 inches deep should give the best results. Potatoes will develop more rapidly in warm soil than in that which is cooler. The soil within the first three or four inches of the surface is warmer than that three or four inches lower down, hence the conditions are more favourable for the potato. The tubers when the potato is in the wild state develop near the surface or on the surface of the ground. It seems natural, therefore, that the cultivated potato should be planted shallow.

On the other hand, much of the success of shallow planting will depend on the moisture of the soil. If the season is very dry the first two inches of soil may be so dry that the potato will not take root readily, and the season of growth will thus be shortened, but this has not happened here during the past four years. Once the roots begin to grow they speedily reach a depth where plenty of moisture is found.

From the results obtained it seems reasonable to conclude that where sandy loam soil is not dry the best results can be obtained from shallow planting. In any case, early planted potatoes will probably succeed best when planted shallow, as the ground will be warmer. In places where the spring is late or where the ground is cold, best results will probably be had by shallow planting.

Although the best results have been obtained in sandy loam soil by planting the sets one inch deep, this method is not recommended for field culture. Unless the surface of the soil is kept loose and free from weeds the potato crop will not be large. In order to kill a large proportion of the weeds which grow, the ground should be harrowed once or twice before the potatoes come up or just as they are coming up. If the sets were planted only one inch deep and the soil harrowed, many of them would be dragged out, hence about four inches deep would probably be the best.

Depth of Planting.	Yield per acre, 1898.		Yield per acre, 1899.		Yield per acre, 1900.		Yield per acre, 1901.		Average Yield per acre, 1898–1901.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
1 inch	347	36	532	24	468	36	371	48	430	6
2 inches	244	12	469	28	462	00	321	12	349	13
3 "	281	36	493	41	422	24	343	12	385	13
4 "	277	12	520	18	404	48	312	24	378	40
5 "	290	24	474	19	334	24	319	00	354	24
6 "	264	00	421	5	367	24	327	48	345	4
7 "	290	24	392	3	336	36	242	00	315	15
8 "	266	12	353	19	345	24	182	36	286	52

POTATOES PLANTED AT DIFFERENT DATES.

In 1898, an experiment was begun in planting potatoes at different dates, beginning when the main crop was put in and continuing at intervals of two weeks until August 23, 1898 ; July 23, 1899 ; July 21, 1900 ; and July 11, 1901. An early and a late variety were used each year, the varieties being Early Norther and Irish Daisy, in 1898 ; Early Norther and Rural Blush, in 1899 ; Early Norther and Sir Walter Raleigh, in 1900, and Early St. George and Rural No. 2, in 1901.

In 1898 and 1899 the decrease after the third planting was so great that it appeared as if a fair crop of marketable potatoes could not be produced when the seed was

planted much after June 24, but the results obtained in 1900 by planting on July 7 proved that it is possible to produce a good crop of potatoes after a crop of early vegetables, such as pease, has been removed. The fourth planting in 1901 was a little later than in previous years and the season not as favourable as in 1900.

Date of Planting.	Total Yield per acre, 1898.		Total Yield per acre, 1899.		Total Yield per acre, 1900.		Total Yield per acre, 1901.		Average Total Yield per acre, 1898–1901.		Average Yield per acre, Marketable, 1898–01		Average Yield per acre, Unmarketable, 1898–1901.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Early Variety.														
1st planting, May 26, 1898; May 26, 1899; May 26, 1900; May 30, 1901	277	12	505	47	409	12	374	00	391	33	337	55	53	38
2nd planting, June 10, 1898; June 9, 1899; June 9, 1900; June 13, 1901	160	36	459	48	453	12	299	12	343	12	276	25	67	47
3rd planting, June 24, 1898; June 23, 1899; June 23, 1900; June 27, 1901	125	24	237	10	365	12	246	24	243	32	196	1	47	31
4th planting, July 8, 1898; July 7, 1899; July 7, 1900; July 11, 1901	30	48	9	41	268	24	74	48	95	55	67	6	28	49
5th planting, July 23, 1898; July 21, 1899; July 21, 1900	1	6	....		26	24								
6th planting, August 9, 1898 / 7th " " 23, 1898	No yield													
Late Variety.														
Planted on same dates as the early variety—														
1st planting	259	36	338	48	277	12	501	36	344	18	296	7	48	11
2nd "	173	48	164	34	338	48	404	48	270	29	216	22	54	7
3rd "	68	12	157	18	198	00	325	36	187	16	158	9	29	7
4th "	8	48	19	22	202	24	57	12	71	56	40	42	31	14
5th "	1	6	....		26	24								
6th " / 7th "	No yield													

POTATOES—RESULTS OF SPRAYING WITH BORDEAUX MIXTURE FOR THE PREVENTION OF BLIGHT AND ROT.

It is the usual practice to spray the experimental plots of potatoes at the Central Experimental Farm with Bordeaux mixture for the prevention of rot and blight, but owing to the nature of the soil in which they are planted, nearly always a light sandy loam, it is seldom that rot is troublesome. This year, however, 8 varieties were planted on May 30 in heavier and wetter soil, for the purpose of demonstrating the advantage of spraying. Of each variety there were four rows, 33 feet in length, sprayed, and the same area left unsprayed. The mixture was 6 lbs. of bluestone, 4 lbs. of lime, and 40 gallons of water. The first spraying was made on July 2, and the vines were kept covered with the mixture throughout the rest of the season.

Name of Variety.	Plants dead where sprayed.	Plants dead where unsprayed.	Total yield per acre, sound potatoes, sprayed.		Total yield per acre, sound potatoes, unsprayed.		Difference in yield per acre, sprayed and unsprayed.		Yield of rotten potatoes per acre, unsprayed.	
			Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Swiss Snowflake..........	Oct. 4, not dead.....	Sept. 28..	342	6	229	54	112	12	26	24
Burnaby Mammoth	Sept. 30..	" 21..	464	12	292	36	171	36	47	18
American Wonder......	" 30..	" 21..	377	18	222	12	155	6	77	
General Gordon..........	" 30..	" 19..	313	30	270	36	42	54	19	48
Early Norther............	Oct. 2..	" 20..	322	18	306	54	15	24	8	48
Rose No. 9...............	Sept. 30..	" 21..	497	12	376	12	121		2	12
Early Harvest...........	" 28..	" 16..	426	48	310	12	116	36	27	30
Lee's Favorite...........	" 30..	" 16..	272	48	246	24	26	24	20	54

There was a very light crop of potatoes this season owing to dry weather at a critical period in the growth of the plants, followed later on by blight and rot, and thus the results obtained by spraying with Bordeaux mixture show the great importance of this work. It will be observed that the sprayed plants grew from 6 to 14 days longer than the unsprayed, during which time the small potatoes were getting larger and the crop greater. There were no rotten potatoes in the sprayed lot.

EXPERIMENTS WITH TOMATOES.

After five years' test a large number of varieties of tomatoes were discontinued this year, but with the new kinds added there were 100 varieties still under test this season, but more will be discarded before planting next year.

The yields of the twenty-five best yielding varieties, only, are published, as space will not permit of giving a full table. In addition to this list, however, will be found the names of the six earliest varieties for this year, also the six wrinkled and twelve smooth kinds which have averaged the highest yields for six years. It will be noticed that the Canada Victor has been put in the table of wrinkled varieties this year, as the proportion of wrinkled tomatoes produced by it is greater than smooth.

The seed of the tomatoes grown this year was sown in hot-beds on April 6 ; the young plants were pricked out into strawberry boxes on April 29, and planted in the open ground on June 3. They were placed four feet apart each way, and five plants of each variety were used. The soil was a light sandy loam in which tomatoes had been grown the previous season. It was heavily manured for tobacco in 1899, but none was applied in 1900. Rye was sown in the autumn of 1900 and ploughed under on May 30, and the land prepared for tomatoes without any additional fertilizer. The soil was kept cultivated until the growth of the plants prevented it. The vines were not trained in any way, but were allowed to lie on the ground. This was a favourable season for tomatoes and there was little green fruit left on the vines when frost came. There was considerable rot this year, but notwithstanding that fact the crop of good tomatoes was large.

TOMATOES—TEST OF VARIETIES.

Name of Variety.	Date of first ripe fruit.	Yield of ripe fruit, first three pickings.		Yield of ripe fruit, balance of pickings.		Total yield of ripe fruit, all pickings.		Remarks.
		Lbs.	ozs.	Lbs.	ozs.	Lbs.	ozs.	
1 Baltimore Prize Taker	Aug. 14..	....		127	15	127	15	Above medium size, smooth, purplish pink.
2 Child's Ruby Queen..	" 24..	....		124	9	124	9	Large to very large, deep red, wrinkled.
3 King Humbert.......	" 9..		15	118	13	119	12	Below medium, wrinkled, scarlet.
4 Creekside Glory	" 19..	....		118	2	118	2	Above medium, wrinkled, scarlet.
5 Extra Early Red.....	" 5..	1	1	116	14	117	15	Below medium, smooth, scarlet.
6 Extra Early Advance.	" 6..		6	113	5	113	11	Below medium, smooth, scarlet.
7 Turner's Hybrid.....	" 1..		13½	109	7	110	4½	Large, smooth to slightly wrinkled, purplish.
8 Early Bermuda......	" 3..		9¾	107	13	108	6¾	Medium to above medium, wrinkled, scarlet.
9 Freedom	" 8..		6	107	4	107	10	Medium to below medium, smooth, scarlet.
10 Early Michigan......	" 24..	....		107	10	107	10	Medium, smooth, scarlet.
11 Maule's Earliest	" 12..		8½	105	3½	105	12	Medium to large, wrinkled, scarlet.
12 Burpee's Climax......	" 14..	1	4½	103	4½	104	9	Medium, smooth, purplish pink.
13 Extra Early Purple Advance............	" 6..		2	102	10	102	12	Medium to below medium, smooth, purplish pink.
14 Extra Early Jersey ..	" 5..	1	5½	101	00	102	5½	Medium to above medium, wrinkled, scarlet.
15 Acme................	" 18..	....		100	7	100	7	Medium, smooth, purplish pink.
16 Money Maker	" 3..		4¾	98	13	99	1¾	Medium to above medium, wrinkled, scarlet.
17 Long Keeper	" 15..		4	98	10	98	14	Medium, smooth, purplish pink.
18 Improved Trophy....	" 12..		6	98	00	98	6	Above medium to large, smooth, scarlet.
19 Essex Hybrid.......	" 19..	.... ..		96	12	96	12	Above medium, smooth, purplish pink.
20 Bright and Early	" 17..	....		96	1	96	1	Below medium, smooth, scarlet.
21 Sutton's Eclipse......	" 22..	.... . .		94	4	94	4	Medium, smooth, scarlet.
22 Liberty Bell..........	" 19..	....		92	12	92	12	Medium to above medium, smooth, scarlet.
23 Early Bird	" 3..		15	91	6	92	5	Below medium, smooth, purplish pink.
24 Conqueror	" 5..		6	91	14	92	4	Medium to large, wrinkled, scarlet.
25 Sparks' Earliana.....	July 27..	3	8½	86	6	89	14½	Medium, smooth, scarlet.

TOMATOES—SIX EARLIEST VARIETIES.

Name of Variety.	Date of First Ripe Fruit.	Yield of Ripe Fruit, First Three Pickings.		Yield of Ripe Fruit, Balance of Pickings.		Total Yield of Ripe Fruit, All Pickings		Remarks.
		Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	
Sparks' Earliana ..	July 27....	3	8½	86	6	89	14½	Medium size, smooth, scarlet.
Earliest of All....	Aug. 3....	1	7¼	53	8	54	15¼	Above medium, wrinkled, scarlet.
Extra Early Jersey	" 5....	1	5½	101	0	102	5½	Medium to above, wrinkled, scarlet
Dominion Day....	" 1....	1	1¾	71	0	72	1¾	Above medium, wrinkled, scarlet.
Extra Early Red..	" 5...	1	1	116	14	117	15	Below medium, smooth, scarlet.
Essex Early South.	" 3....	0	15¼	74	6	75	5¼	Below medium, smooth, scarlet.

The first fruit of a few other varieties was ripe earlier than some of these, but the yield from the first three pickings was smaller. Sparks' Earliana was the best early tomato in 1901.

SIX BEST YIELDING WRINKLED VARIETIES—AVERAGE FOR SIX YEARS.

Name of Variety.	Average Date of First Ripe Fruit.	Average Yield per Acre.		Remarks.
		Lbs.	Ozs.	
Early Bermuda	Aug. 6	17	5	Medium to above medium, wrinkled, scarlet.
Money Maker	" 4	16	0	Medium to above, wrinkled, scarlet.
Extra Early Jersey	" 4	15	5	Medium to above, wrinkled, scarlet.
Canada Victor	" 4	15	5	Medium size, wrinkled to smooth, scarlet.
Early Richmond	" 5	14	8	Medium to above, wrinkled, scarlet.
Conqueror	" 2	14	0	Medium to large, wrinkled, scarlet.

TWELVE BEST YIELDING SMOOTH VARIETIES—AVERAGE FOR SIX YEARS.

Baltimore Prize Taker	Aug. 7	16	8	Medium to above medium, regular, smooth, purplish pink.
Extra Early Advance	" 4	15	4	Below medium size, smooth, scarlet.
Bond's Early Minnesota	" 1	15	0	Medium to below medium, smooth, purplish pink.
Essex Hybrid	" 8	14	10	Medium to above medium, regular, smooth, purplish pink.
Brinton's Best	" 13	14	9	Above medium to large, regular, smooth, scarlet.
Comrade	" 7	14	8	Medium to below medium, smooth, scarlet.
Early Ruby	July 31	14	7	Medium size, smooth to slightly wrinkled, scarlet.
Trophy	Aug. 13	13	15	Above medium to large, smooth, scarlet.
Mayflower	" 7	13	9	Medium to large, regular, smooth, scarlet.
Autocrat	" 11	13	7	Medium to above, smooth, purplish pink.
Atlantic Prize	" 5	12	14	Medium size, smooth to wrinkled, scarlet.
Matchless	" 12	12	11	Above medium size, regular, smooth, scarlet.

For shorter periods, the following varieties have averaged well :—Bright and Early (5 years), 16 lbs. 6 oz. ; Freedom (4 years), 14 lbs. 9 oz. ; Maule's Earliest (3 years), 14 lbs. 15 oz. ; Creekside Glory (3 years), 14 lbs. 4 oz. ; Early Bird (3 years), 14 lbs. 1 oz.

PEASE—EXPERIMENTS FOR COMPARISON OF YIELDS AND QUALITY.

For the past four years a large number of varieties of garden pease have been tested in the horticultural department and notes taken on their earliness, productiveness, and quality ; the length of vines being also ascertained. In 1900, twenty-seven varieties which were considered the most promising from the standpoint of yield and quality were grown on larger plots in order to learn which were the best. This experiment was continued this year and the average results for the two years are given in the following table.

Twelve hundred selected pease of each variety were sown in drills 100 feet long and 2½ feet apart on May 10. The pease germinated well and there was a good stand. As each variety became ready for use, the date was recorded and the yields of green pods from the several pickings also made.

PEASE—TEST OF VARIETIES.

Name of Variety.	Ready for Use, 1900.	Ready for Use, 1901.	Number of Pickings, 1900.	Number of Pickings, 1901.	Total Yield of Green Pods, 1900.	Total Yield of Green Pods, 1901.	Average Yield of Green Pods, 1900-1901.	Length of Vine, 1900.	Quality.
					Qts.	Qts.	Qts.	Inches.	
Early.									
Gregory's Surprise......	June 29	July 1	3	3	20	31	25½	18 to 22	Very good.
Cleveland's First and Best	July 1	" 1	3	3	26	31	28½	20 " 22	Medium.
Alaska..................	" 2	....	2	.....	24	......	......	24 " 28	"
Station..............	" 3	July 1	2	3	22	29	25½	18 " 21	Very good.
Premium Gem	" 4	" 5	3	4	36	34	35	24 " 28	"
Chelsea....	" 4	" 8	4	3	31	30	30½	12 " 16	"
Nott's Excelsior..........	" 4	" 5	2	3	23	20	21½	12 " 15	"
Child's Morning Star.....	" 4	" 1	2	2	19	25	22	30 " 34	"
Exonian.................	" 4	" 4	2	3	20	29	24½	24 " 26	Good.
American Wonder..	" 5	" 6	2	3	22	31	26½	15 " 20	Very good.
Second Early.									
Nott's New Perfection....	" 9	" 10	3	4	33	33	33	22 " 26	Very good.
Gradus	" 9	" 6	2	4	29	29	29	28 " 32	"
English Wonder..........	" 9	" 10	3	4	26	31	28½	16 " 20	Good.
Medium.									
McLean's Little Gem....	" 12	" 13	3	6	36	42	39	34 " 40	Very good.
McLean's Advancer......	" 14	" 13	3	6	38	35	36½	30 " 34	"
Burpee's Quantity........	" 17	" 12	2	3	47	38	42½	34 " 38	Good.
Heroine.....	....	" 17	......	3	......	18			
Late.									
Dwarf Telephone.......	July 19	" 24	3	2	40	16	28	22 " 26	Very good.
Startler..................	" 19	" 17	2	4	41	32	36½	38 " 42	"
McLean's Prolific....... ..	" 21	" 20	2	4	62	24	43	36 " 40	Good.
Yorkshire Hero.........	" 21	" 17	2	4	36	27	31½	30 " 34	Very good.
New Victory.............	" 22	....	2	......	52	......	......	38 " 42	Good.
Champion of England .. .	" 23	July 19	2	4	60	39	49½	60 " 66	Very good.
Boston Wrinkled.........	" 23	" 17	2	4	54	45	49½	48 " 52	Good.
Eugenie......	" 23	" 17	3	4	50	29	39½	48 " 54	"
Juno.................. ...	" 23	" 21	2	3	44	18	31	30 " 34	"
Stratagem, Improved.....	" 24	" 17	1	3	36	14	25	28 " 32	Very good.
Veitch's Perfection.	" 31	" 19	2	4	38	23	30½	60 " 66	Good.

EXPERIMENTS WITH CORN.

For the past three years a large number of varieties of garden corn have been tested. In the reports for 1899 and 1900 full lists were published of the varieties with notes regarding them. Owing to the lack of space, the results this year are given of only twenty-four kinds, these being the varieties which have given the best average yields for three years in the several classes into which the varieties were divided, namely, early, second early, medium, and late. The soil in which the corn was planted was a light sandy loam on which squash, melons, and tobacco had grown in 1900. It received a good dressing of barn-yard manure in the spring of 1901, and was then ploughed and thoroughly harrowed. The corn was planted on May 31 in hills three feet apart each way, the places having been previously marked by a corn planter. About six kernels were planted in a hill. After germination had taken place and danger from cut-worms was over, the number of plants in a hill was reduced to four. Twenty-four hills of each variety were planted, but twelve average hills of each were used for comparison. The corn was kept thoroughly cultivated

during the summer and when growth had ceased in the autumn it was cut and the ears removed and counted.

Name of Variety.	Kind.	Fit for use, 1899.	Fit for use, 1900.	Fit for use, 1901.	Height, 1901.	Length of ears, 1899.	Length of ears, 1900.	Length of ears, 1901.	Average length of ears for 3 years.	Marketable ears from 12 hills, 1899.	Marketable ears from 12 hills, 1900.	Marketable ears from 12 hills, 1901.	Average number of marketable ears for 3 years.
					Ft. in.	in.	in.	in.	in.				
Early Varieties.													
Burbank's Early Maine...	Sweet	Aug. 16	Aug. 11	....	7 6	6	6½	8	6⅚	59	54	77	63
Early Fordhook..........	"	" 17	" 10	Aug. 13	5 11	6	6	7	6⅓	52	52	79	61
Extra Early Cory........	"	" 15	" 11	" 13	5 10	6½	5½	7	6⅓	60	53	67	60
Lackey's Early Sweet....	"	" 17	" 11	" 14	6 8	7	6	7½	6⅚	56	48	68	57
Early Marblehead........	"	" 15	" 12	" 13	5 11	7	6	7	6⅔	52	48	59	53
Ford's Early............	"	" 17	" 11	" 12	5 7	7	7	7½	7⅙	49	52	55	52
Second Early.													
Crosby's Extra Early.....	"	" 23	" 27	" 24	7 0	6	6	7	6⅓	50	69	56	58
Low's Perfection.........	"	" 25	" 31	" 27	8 1	7½	8	7½	7⅔	59	71	42	57
Kendall's Early Giant..	"	" 21	" 22	" 24	7 4	7½	6½	7½	7⅙	43	40	79	54
Early Giant Sweet........	"	" 24	" 20	" 27	7 6	7½	6	8½	7⅓	52	37	59	49
Shaker's Early............	"	" 26	" 27	" 27	7 6	8	9	8	8⅓	50	50	42	47
Child's Honey Dew......	"	" 25	" 29	" 24	7 0	7	7	8	7⅓	54	46	38	46
Intermediate.													
Black Mexican..........	"	" 28	Sept. 9	Aug. 29	7 2	7	6½	7½	7	71	67	57	65
Burlington Hybrid........	"	" 28	" 7	Sept. 3	8 4	8	7½	8	7⅚	53	64	60	59
Stablers' Early..........	"	" 29	Aug. 28	Aug. 27	7 6	8	8	7½	7⅚	39	57	64	53
Roslyn Hybrid..........	"	Sept. 1	Sept. 10	" 27	8 2	8	8	8	8	38	62	46	49
Moor's Early Concord....	"	Aug. 31	" 6	" 28	8 4	8	7½	7½	7⅔	44	50	47	47
Zig Zag Evergreen.......	"	Sep. 2	" 15	Sept. 2	8 2	7	6½	7	6⅚	35	40	65	47
Late Varieties.													
Bonanza Sweet..........	"	Sept. 4	Sept. 10	Aug. 26	7 2	7	8	7	7⅓	35	51	62	49
Country Gentleman......	"	" 12	" 12	Sept. 4	8 0	7	7	6½	6⅚	44	58	40	47
Shoe Peg.................	"	" 4	" 18	" 3	7 6	6	7	7	6⅔	30	47	41	39
Columbus Market.........	"	" 4	" 16	" 2	8 10	10	8	10	9⅓	36	40	42	39
Mammoth Sweet..........	"	" 12	" 19	Aug. 30	9 4	6	8	9½	7⅚	14	45	42	34
Stowell's Evergreen......	"	" 12	" 12	Sept. 3	9 0	7	7½	9	7⅚	16	42	42	33

EXPERIMENTS WITH MUSK MELONS.

A large number of varieties of musk melons have been tested during the past three years, and notes were taken on their productiveness, quality and time of maturing. In 1901 there were 62 varieties under test, most of which ripened. The seed was sown in strawberry boxes on May 6 and the plants grown in a hot-bed until June 4, when they were planted in the open ground, the soil being a warm light sandy loam. The melons were put in hills eight by eight feet apart, which had been prepared by removing the soil and replacing it with two shovelfuls of short barn-yard manure on which were thrown back from four to five inches of the surface soil. When the hills were ready the strawberry boxes were broken without loosening the soil, and the plants were then carefully set. When established there were usually four plants to a hill. The soil was kept cultivated until the growth of the plants prevented it.

In the following table the names are given of the twenty-five varieties which have averaged the best crops in three years, with notes regarding them.

MUSK MELONS.

Name of Variety.	Date of First Ripe Melon, 1899.	Date of First Ripe Melon, 1900.	Date of First Ripe Melon, 1901.	Number of Ripe Melons, 1899.	Number of Ripe Melons, 1900.	Number of Ripe Melons, 1901.	Average No. of Ripe Melons for 3 Years.	Average Weight per Melon for 1901. Lbs.	oz.	Size and Quality.
Netted Gem	Sept. 13.	Sept. 5.	Aug. 30.	8	45	88	47	1	1½	Small, green flesh, good quality.
Rocky Ford	Aug. 29.	" 10.	Sept. 4.	25	37	54	39	0	14¾	" "
Extra Early Prize	" 29.	" 3.	Aug. 24.	32	45	27	35	1	8	Small, green flesh, poor quality.
Earliest Ripe	Sept. 8.	" 8.	" 22.	23	37	46	35	1	6	Above medium, yellow flesh, medium quality.
Emerald Gem	" 2.	Aug. 29.	" 28.	14	39	37	30	1	12	Small, yellow flesh, very good quality.
The Captain	" 13.	Sept. 5.	" 30.	21	28	42	30	1	3	Small, green flesh, medium quality.
Earliest of All	" 19.	" 8.	" 24.	5	15	41	20	0	14	Small, green flesh, good quality.
Early Bristol	" 13.	" 18.	" 30.	1	30	26	19	2	0	Below medium size, green flesh, medium quality.
Early Green Nutmeg	" 8.	" 13.	Sept. 4.	6	8	39	18	2	10¼	Medium size, green flesh, very good quality.
White Japan	" 19.	" 10.	" 3.	11	6	36	18	2	7½	Below medium size, green flesh, very good quality.
Cosmopolitan	" 8.	" 8.	Aug. 28.	11	16	25	17	2	8	Medium size, green flesh, very good quality.
Golden Jenny	" 19.	" 17.	" 28.	7	5	40	17	1	2½	Small, green flesh, medium quality.
Long Yellow	Aug. 26.	" 8.	" 22.	9	2	37	16	4	11¾	Large, yellow flesh, poor quality.
Pine Apple	Sept. 13.	" 3.	" 31.	6	7	34	16	1	15¼	Small, green flesh, good quality.
Hackensack	" 19.	" 19.	" 24.	7	1	39	16	3	0	Medium size, green flesh, good quality.
Early Burlington	" 23.	" 10.	" 31.	10	16	21	16	1	9½	Below medium size, green flesh, good quality.
Princess	" 19.	" 18.	" 31.	4	15	27	15	3	1	Medium size, green flesh, good quality.
Banana	" 23.	" 25.	Sept. 7.	5	12	27	15	4	10¾	Medium size, yellow flesh, good quality.
Improved Cantaloupe	" 2.	" 18.	Aug. 26.	7	4	28	13	5	0¾	Above medium size, deep yellow flesh, poor quality.
Early Cassaba	" 8.	" 18.	Sept. 4.	13	2	25	13	2	11	Below medium size, green flesh, good quality.
Missouri	" 29.	" 10.	" 7.	1	15	24	13	1	15½	Below medium size, green flesh, good quality.
Christiana	" 13.	" 8.	Aug. 31.	5	6	26	12	2	3½	Below medium size, yellow flesh, very good quality.
Bay View	" 25.	" 17.	Sept. 4.	5	4	23	11	4	0½	Below medium size, green flesh, medium quality.
Surprise	" 19.	" 17.	" 4.	3	2	29	11	4	1¼	Medium size, yellow flesh, very good quality.
New Triumph	" 29.	" 4.	Aug. 26.	1	3	30	11	3	12½	Above medium size, deep yellow flesh, good quality.

It will be noticed that the Montreal Market, one of the best commercial melons, does not appear in this list, the reason being that it is a comparatively late variety and needs to be forced under glass for a time after planting.

EXPERIMENTS WITH TOBACCO.

There were 46 varieties of tobacco tested this year, and nearly all of these matured, as the season was very favourable for the growth of this plant. The seed was

sown in a hot-bed on April 11, and the young plants transplanted to a cold frame on May 17, and planted in the field on June 12. The soil was a sandy loam, which received a good dressing of partially rotted manure in the spring, which was ploughed under and the ground thoroughly harrowed and marked. The plants were then set 3 x 3½ feet apart, after which the soil was kept thoroughly cultivated until there was danger of the leaves being injured. The tops and suckers were removed at the proper time. In this test 15 average plants were selected from the 20 planted and the yield is estimated from them. Naturally the yield per acre is greater than if the plots had been larger. The tobacco was cut on September 8 and taken to the curing house, and when cured the leaves were stripped and weighed.

In the following table the average results are given for 1898, 1900 and 1901. There was a little more moisture than there should have been when the tobacco was weighed in 1899 and the yields for that year are not included.

Name of Variety.	Date of Topping, 1901.	Total Yield per acre, 1901.		Total Yield per acre, 1900.		Total Yield per acre, 1898.		Average Total Yield for 3 years.	
		Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
Maryland	Aug. 1	2,937	13	2,350	7	1,844	14	2,377	11
Pennsylvania Seed Leaf	July 30	2,886	1	2,073	13	1,391	8	2,117	2
Brazilian American	" 24	2,419	6	1,831	14	1,557	14	1,936	6
Safrano	" 29	2,765	1	1,399	14	1,588	2	1,917	11
Connecticut Seed Leaf	" 29	2,713	14	1,417	2	1,427	6	1,852	13
Tennessee Red	" 29	2,160	3	1,555	5	1,633	8	1,783	0
East Hartford	Aug. 1	2,004	11	1,503	9	1,557	14	1,688	11
Virginia Oak Hill Yellow	July 27	2,143	1	1,624	7	1,285	10	1,684	6
Kentucky Burley	" 27	2,039	4	1,157	15	1,746	15	1,648	1
Climax	Aug. 1	2,142	15	1,382	12	1,391	8	1,639	1
Tuckahoe	July 27	1,952	13	1,572	11	1,187	5	1,570	15
Sterling	" 27	1,883	11	1,589	14	1,209	3	1,560	15
Hyco	" 27	1,572	10	1,486	4	1,603	4	1,554	1
Gold Leaf	" 29	1,468	15	1,780	0	1,393	10	1,547	8
Virginia One Sucker	" 24	1,866	7	1,261	9	1,391	8	1,506	8
Havana	" 24	2,333	0	1,313	6	850	4	1,498	14
Oronoka Yellow	Aug. 1	1,469	0	1,382	8	1,641	1	1,497	8
Sumatra	July 29	1,987	6	967	13	1,534	9	1,496	9
Pryor Yellow	" 24	1,676	5	1,244	5	1,536	9	1,485	12
Zimmer's Spanish	" 22	1,659	1	1,486	4	1,202	7	1,449	4
Granville Co. Yellow	" 29	1,123	5	1,382	9	1,755	13	1,420	9
Oronoka White Stem	" 24	1,313	7	1,382	9	1,504	15	1,400	5
Hester	" 24	1,572	10	1,123	5	1,421	12	1,372	9
White Stem	Aug. 1	1,071	8	1,192	7	1,614	8	1,292	13
Honduras	July 29	1,071	7	1,296	2	1,232	11	1,200	1
Primus	" 30	1,192	8	1,175	3	1,164	10	1,177	7
Cuban Seed Leaf	" 22	1,140	9	1,192	8	1,020	15	1,118	0
Persian Rose	" 22	1,175	4	1,071	7	710	14	985	14
Florida	" 10	725	15	829	8	748	11	768	1
Canelle	" 8	380	4	397	8	455	7	411	1
White Burley	...	...		1,330	11	1,323	7	...	
Comstock Spanish	July 22	2,298	8	1,348	1	...		...	
Turkish Aromatic	" 29	1,883	12	1,382	8	...		...	
Lancaster Co. Broad Leaf	Aug. 5	1,572	10	1,114	10	...		...	
Kentucky Yellow	July 27	1,555	6	1,192	7	...		...	
Latakia	" 29	1,555	5	846	12	...		...	
Improved White Burley	Aug. 1	1,468	14	1,935	9	...		...	
Goach	July 29	1,434	7	1,399	15	...		...	
Long Leaf Goach	" 29	1,399	13	1,572	10	...		...	
General Grant	" 29	1,382	9	1,382	8	...		...	
Famous	Aug. 1	1,351	1	1,088	12	...		...	
Big Oronoka	July 29	1,244	5	1,330	10	...		...	
Pryor Blue	" 27	1,244	4	1,399	13	...		...	
Bonanza	Aug. 1	1,157	14	1,520	13	...		...	
Persian Muscatelle	July 16	1,019	11	1,175	2	...		...	
Harby	" 10	794	15	1,123	5	...		...	
Small Red Canadian	" 4	397	9	881	9	...		...	

Larger areas were planted with six varieties and the results are given in the following table :—

Name of Variety.	Number of Plants.	Total Yield per acre, dry leaves.	Condition when cut.
	Lbs.	Lbs.	
Connecticut Seed Leaf	550	2,192	Ripe.
Zimmers Spanish	555	1,557	"
Improved White Burley	477	1,546	"
Pennsylvania Seed Leaf	551	1,447	"
Small Havana	541	1,363	"
Little Oronoka	613	1,188	"

FOREST BELTS.

The forest belts at the Central Experimental Farm extend along its northern and western boundaries ; the belt on the western boundary is 165 feet wide, and that on the northern boundary 65 feet ; their total length being nearly 1¾ miles. The number of trees growing in these belts, including those in an evergreen clump, is about 23,300.

The forest belts were planted for several objects, one of the principal being to gain information regarding the growth of the best timber trees, when grown on different kinds of soil and at different distances apart. The distances chosen at first were 5 by 5 feet, 5 by 10 feet, and 10 by 10 feet apart. The planting was also done to learn how the growth of trees planted in blocks of single species compared with that of trees grown in mixed plantations. Another object was to learn what influence the forest belts would have on the crops in the adjoining fields as regards the shelter afforded by them. The planting was also done with a view to the improvement of the landscape, and the various species were arranged so that a good effect would be produced. In addition to all this, it was intended that as much other data as possible should be gathered and that the forest belts would prove object lessons to those who were interested in tree growth.

It is now thirteen years since the first trees were planted in the belts referrd to, and the growth already made is a useful object lesson and should encourage the more extensive planting of timber trees. The soil in which the trees were planted was in many instances poor, and while a number of species appear to succeed almost as well on poor as on good land, yet some kinds require good soil in order to grow successfully. As to the distance apart at which it is desirable that trees should be planted, those which were put 5 by 5 feet apart are making, in most cases, the best trees for timber purposes, as the lower limbs are dying, leaving the trunks clean, which will make the wood freer from knots than where planted 10 by 10, or 10 by 5 feet apart, as at those distances there are, as yet, few instances where the lower limbs have died. The trees planted 5 by 5 feet apart, also, are a little taller as a rule than where wider planting was adopted, but the diameter of the trunk is not so great. The closely planted trees are more protected from storms and there are fewer broken tops and crooked stems. The desirability of close planting was also very apparent until quite recently in the condition of the surface of the ground where the trees are ten feet apart, which, in a number of cases, still required cultivation ; as it was necessary,

in order to keep the sod from forming and checking the growth of the trees, to cultivate the soil, whereas, in most instances, where the trees are planted 5 by 5 feet apart, the surface soil was kept shaded and moist, and sod did not form. As the conditions of soil are different in the belts where the trees are planted in clumps of a single species and where the several kinds are mixed together, a fair comparison of these two methods of planting cannot yet be made, but the advantages derived from mixing the leafier sorts of trees with those which are not very leafy, are already apparent. Where thin foliaged trees had been planted 5 by 5 feet apart and had had eight years' growth, the sod still formed very readily unless the soil was kept cultivated, thus showing that sufficient shade was not afforded to prevent the growth of grass and weeds. In 1899 some plantations were begun with trees and shrubs set 2½ feet apart each way in order to get the ground shaded soon. Most of these have made good growth, and the experiment promises to be very interesting, as different kinds of trees and shrubs were used for undergrowth. These plantations were cultivated this year and in 1900.

In the annual reports for 1897 and 1899, tables were published in which were given the measurements of trees in the forest belts at the Central Experimental Farm. A table is again published this year in which will be found the height and diameter of the trees up to the autumn of the present year.

GROWTH of Trees in the Forest Belts at the Central Experimental Farm.

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average Height, 1900.		Average Height, 1901.		Average Diameter 4′ 6″ from ground, 1901.
			Feet.	Years.	ft.	in.	ft.	in.	
Black Walnut—Juglans nigra	Low sandy loam	1888	5×5	1	11	6	12	..	1 11/12
" "	"	1888	10×10	1	7	..	7	11	1¼
" "	Sandy loam with small stones	1889	5×5	2	16	4	17	7	2 11/12
" "	" "	1889	10×10	2	12	3	13	4	2 17/24
" "	Clay loam	1888	10×5	1	14	1	15	4	2⅞
Butternut—Juglans cinerea	Low sandy loam	1889	5×5	1	11	7	11	11	1⅞
" "	"	1888	10×10	1	10	1	10	6	1⅝
Silver-leaved Maple—Acer dasycarpum	Light sandy loam	1889	5×5	3	27	3	28	..	2⅝
" "	"	1889	10×10	3	24	8	25	1	4¼
European White Birch—Betula alba	"	1889	5×5	3	34	8	35	9	3¾
" "	"	1889	10×10	3	37	3	38	7	6½
Canoe Birch—Betula papyrifera	"	1889	5×5	3	31	..	32	7	3⅝
" "	"	1889	10×10	3	31	1	32	8	5⅛
Yellow Birch—Betula lutea	"	1889	5×5	3	21	10	23	..	2¾
" "	"	1889	10×10	3	21	8	23	6	3 19/24
White Elm—Ulmus americana	Sandy loam	1889	5×5	3	17	3	18	1	2¼
" "	"	1889	10×10	3	18	9	19	8	3 17/24
Black Ash—Fraxinus sambucifolia	Black muck	1889	5×5	2	18	2	18	10	2 5/12
" "	Low sandy loam	1889	10×10	2	11	11	12	5	1 17/24
Green Ash—Fraxinus viridis	Black muck	1889	5×5	3	20	10	22	8	2⅓
" "	Low sandy loam	1889	10×10	3	17	2	18	5	3¼
Red Ash—Fraxinus pubescens	Black muck	1889	5×5	2	22	8	24	4	2 11/12
" "	Light sandy loam	1889	10×10	2	17	2	18	10	2 19/24
White Ash—Fraxinus americana	Black muck	1889	5×5	3	24	1	24	8	2 31/48
" "	Light sandy loam	1889	10×10	3	23	10	25	9	3 13/48
Black Cherry—Prunus serotina	Light sandy loam and gravel	1889	5×5	3	18	11	19	11	2⅝
" "	" "	1889	10×10	3	24	4	26	7	4
Box Elder—Acer Negundo	Light sandy loam	1889	5×5	2	25	2	26	4	3⅛
				in.					
Scotch Pine—Pinus sylvestris	Sandy loam with gravel	1888	5×5	18	23	6	24	9	3⅝
" "	" "	1888	10×10	18	21	2	22	7	4⅝
" "	Low sandy loam with gravel	1888	5×5	18	22	9	24	2	3 1/12
" "	Low sandy loam	1888	10×10	18	21	10	23	..	4⅜
" "	Light sandy loam	1888	10×5	18	24	5	25	9	6⅞
" "	Clay loam	1888	10×5	18	20	9	22	2	5 3/26
" "	Light sandy loam and gravel	1888	10×5	18	23	5	25	2	5⅞
" "	" "	1887	3×3	9	24	4	26	..	3¼

GROWTH of Trees in the Forest Belts at the Central Experimental Farm—*Concluded.*

Name of Species.	Character of Soil.	When Planted.	Distance Apart.	Age or Height when Planted.	Average Height, 1900.		Average Height, 1901.		Average Diameter 4′ 6″ from ground, 1901.
			Feet.	in.	ft.	in.	ft.	in.	
Austrian Pine—Pinus austriaca	Light sandy loam	1889	5 × 5	18	17	10	19	9	$4\frac{1}{4}$
" "	"	1889	10 × 10	18	18	1	19	9	$5\frac{1}{8}$
" "	"	1888	10 × 5	15	17	5	19	7	$4\frac{2}{3}$
" "	Clay loam	1888	10 × 5	15	17	..	18	11	$4\frac{1}{2}$
" "	Light sandy loam and gravel	1888	10 × 5	15	19	6	21	6	5
" "	" "	1887	3 × 3	15	18	..	19	8	$3\frac{1}{6}$
White Spruce—Picea alba	Light sandy loam	1889	5 × 5	15	13	2	14	2	$2\frac{1}{12}$
" "	"	1889	10 × 10	15	14	..	14	10	$2\frac{11}{24}$
Norway Spruce—Picea excelsa	"	1889	5 × 5	18	15	11	17	2	$2\frac{3}{8}$
" "	"	1889	10 × 10	18	20	1	22	..	$3\frac{1}{3}$
" "	"	1888	10 × 5	15	23	4	25	7	$3\frac{3}{4}$
" "	Clay loam	1888	10 × 5	15	23	11	25	11	$4\frac{5}{6}$
American Arbor-vitæ—Thuya occidentalis	Low sandy loam and black muck	1889	5 × 5	18	15	..	16	5	$2\frac{2}{3}$
" "	Low sandy loam	1889	10 × 10	18	13	9	14	10	$2\frac{5}{12}$
				feet.					
European Larch—Larix europæa	"	1888	5 × 5	2	26	10	28	..	$3\frac{1}{2}$
" "	"	1888	10 × 10	2	27	6	28	5	$4\frac{5}{8}$
White Pine—Pinus Strobus	Light sandy loam with gravel	1889	5 × 5	8 to 10 in.	22	9	24	6	$3\frac{17}{24}$
" "	" "	1889	10 × 10	8 to 10 in.	21	..	22	7	$5\frac{1}{3}$

The trees in the above table which have not made satisfactory growth owing to unsuitability of soil and other causes are Black Walnut, Butternut, White Elm, and Norway Spruce. Under better conditions these trees would have made much more growth.

During the autumn of 1901 the following additions were made to the trees in the forest belt along the western boundary. These were planted to replace other kinds which had not succeeded. The trees and shrubs were planted 2½ feet apart each way, the object being to get the ground shaded as soon as possible, in order that weeds would be killed, moisture conserved and the soil kept from baking without having to cultivate. There was also the important object of making the permanent trees shoot up straight without side branches. Necessarily, the great majority of the trees and shrubs planted were for this purpose.

Name.	Number Planted.	Height when planted.
White Ash (*Fraxinus americana*)	275	4 feet.
Tamarac (*Larix americana*)	413	3 "
White Spruce (*Picea alba*)	105	2 "
Box Elder (*Acer negundo*)	300	2-year-old tree cut back to ground.
Alder Buckthorn (*Rhamnus Frangula*)	879	6 inches.
Ninebark (*Neillia opulifolia*)	203	2-year-old shrubs cut back to ground.
Rosemary Willow (*Salix rosmarinifolia*)	1,483	Unrooted cuttings.
Total	3,658	

In addition to these there were Black Walnut, White Pine, Hard Maple, Rosemary Willow, Sand Cherry, and White Ash used to complete the plantations begun in 1899.

ARBORETUM AND BOTANIC GARDEN.

Comparatively little is known of the Arboretum and Botanic Garden at the Central Experimental Farm, except by those who have visited Ottawa and seen it. When the farm was purchased, in 1886, sixty-five acres were selected for that purpose, and planting was begun in the autumn of 1889. Most of the land is high, and a fine view is obtained of the city of Ottawa on the north and east, while to the south there is a pleasing view across country with glimpses of the Rideau river in the distance. The Arboretum is bounded on one side by the Rideau canal, which at this point has marshy banks which take away much of the sameness which the canal would otherwise have, and also afford a splendid opportunity for experiments with aquatics, though little has yet been done in this direction.

Twelve years ago, when the first planting was made, comparatively little was known of the hardiness of a large number of trees, shrubs and herbaceous plants, as the number of species and varieties found in gardens was limited, but now 3,728 kinds of trees and shrubs, and over 1,600 perennials have been tested and notes taken on all of them. The number of individual specimens of trees and shrubs living in the Arboretum at the present time is more than 4,200. This large collection has been obtained from many sources. From donations of seeds from botanic gardens throughout the world a large number of species and varieties have been grown, the Royal Gardens, Kew, supplying many of them. The catalogues of nurserymen in America, Europe, and Asia have been searched to increase the collection until it is now difficult to obtain additional species of many genera.

Particular attention has been given to those genera which include a large number of hardy species, such as Syringa, Lonicera, and Berberis, and these have been made as complete as possible, as their usefulness extends over a larger area than those which are not so hardy.

Descriptive lists of hardy trees, shrubs and herbaceous perennials which have been found the most ornamental have been published, and have proven very useful to persons desiring to plant their grounds. A catalogue has also been published of all the trees and shrubs tested in the Arboretum up to the year 1899, and notes given as to their hardiness ; but in this list no descriptions are given.

The winter of 1900-1 caused more injury than usual to the trees and shrubs, some species and varieties which had hitherto been hardy having their tops badly winter killed. There were long spells of dry, cold weather last winter, and there was probably more evaporation from the wood than the trees could stand ; as confirming this opinion, some trees and shrubs which are not hardy and which grow late in the autumn and are thus well charged with sap when winter sets in, were no more injured than usual.

The Arboretum looked better this year than ever before, as more labour was given to it than previously ; the trees and shrubs also as they grow larger add to the beauty of it.

This year a nursery was established in part of the Arboretum in which were planted the trees and shrubs which are to be used by the Ottawa Improvement Commission for beautifying the city of Ottawa.

Few trees and shrubs were planted in the Arboretum this year, but 525 specimens of nearly as many species and varieties were imported from Europe and were grown in nursery rows this year as it was thought that better results would be obtained than if they were planted in their permanent places at once.

The collection of perennials was increased by 525 species and varieties this year, making a total of 1,586 species and varieties now living in the border. A large collection of species and varieties of Michaelmas daisies or wild asters which was planted this year added much to the attractiveness of the border this autumn. Some of the new varieties are very handsome and should be planted in every garden, as they bloom until killed by frost.

LILACS.

The lilac is one of the most popular hardy shrubs, which is due largely to the delicious perfume and delicate tints of the flowers, its extreme hardiness and ease of culture, and also to the fact that it begins to bloom during the month of May, when all flowers are much appreciated. The leaves develop early in the spring and do not fall until late in the autumn, which, with their attractive deep green colour, add to the beauty and popularity of this shrub. By making a judicious selection of species and varieties of lilacs, bloom may be obtained from the third week of May until the first week of July. It is an old favourite, the common species (*Syringa vulgaris*), having been cultivated more than three hundred years ago, but it is only during comparatively recent times that it has been improved and the exquisite varieties produced which are such an acquisition to our gardens. The first double variety was introduced in 1870. Although there are now 11 species in cultivation, most of these were introduced during the last one hundred years. There are 130 species and varieties being tested in the Arboretum which includes all the species and most of the varieties in cultivation.

The lilac may be propagated very easily either by budding or root grafting on lilac stock, which may be grown quite readily from seed or obtained as suckers from older bushes. It is quite possible also to graft the lilac on privet or ash, but these

stocks are not satisfactory. The lilac will also grow from green or ripe wood cuttings. Some of the varieties now to be obtained were originated by cross-breeding, and this work offers a very delightful field for him who will devote his time to it.

Lilacs grow well in many kinds of soil, but they do best in that which is moderately rich and well drained. They produce such an abundance of flowers and seeds that if grown in poor soil they will soon deteriorate. Suckers should be kept cut out of the older bushes, as these often are the cause of the shrubs not blooming well, and where grafted or budded varieties are grown it is absolutely necessary to do this. Very little additional pruning is needed. During recent years lilacs have been used quite extensively for forcing, the white varieties being the most popular.

Insects rarely injure the flowers or foliage of lilacs and they are seldom affected by disease, the leaves, however, being occasionally mildewed.

Following is a descriptive list of the species tested here and of the best varieties which have flowered. The species are arranged according to their time of blooming, beginning with the earliest :—

Syringa vulgaris, L. (Common lilac).—The common lilac is a native of Eastern Europe, and was introduced to cultivation in 1597. It is the best known of all the lilacs, being found growing in nearly every garden, but is often neglected and allowed to sucker badly, but even with this neglect it produces a profusion of flowers which are not surpassed in perfume by any of the newer varieties. It begins to bloom during the third week of May and lasts until near the end of the month. There are a much larger number of seedlings of this species than of any other and some of them are greatly superior to the parent, being of exquisite form and colour. Of these, 110 are being tested in the Arboretum, and the following are the best of those which have bloomed :—

S. vulgaris, Leon Simon.—A very double variety with a large compact truss and large flowers of a fine shade of lilac, with short petals. The buds are of a brighter tint which adds to its attractiveness. Blooms in the last week of May. One of the best doubles.

S. vulgaris, Maxime Cornu.—Double. Truss large. A very distinct variety, the flowers of which are almost pink. Very good. Blooms during the fourth week of May.

S. vulgaris, Charles X.—Single. This is one of the oldest yet one of the best of the improved varieties. It is a most profuse bloomer, no other variety excelling it in this respect. The trusses are large and the flowers of an attractive deep purplish red colour. It blooms a few days later than the common lilac, being at its best during the fourth week of May.

S. vulgaris, Jean Bart.—Double. Truss large and loose. Flowers double and of a fine shade of purple with twisted petals which give it a more graceful appearance than some of the more compact sorts. It is also beautiful when in bud, being then deep lilac. Very good. Blooms during the fourth week of May.

S. vulgaris, Jacques Calot.—Single. A free bloomer with large trusses and very large flowers, the latter being of an attractive shade of lilac. Blooms during the fourth week of May. One of the best.

S. vulgaris, Souvenir de Ludwig Spath.—Single. This is a variety with very dark purple flowers which makes a striking contrast to most of the other shades. Blooms in the fourth week of May.

S. vulgaris, Michel Buchner.—Double. A very free blooming variety with trusses above the medium size, and having large double flowers of a fine pale shade of lilac, the buds being of a rosy hue. Blooms during the fourth week of May. One of the best.

S. vulgaris, Furst Liechtenstein.—Single. Truss and flowers large, the latter being of an attractive lilac colour with a pinkish shade. A fine variety.

S. vulgaris, Madame Abel Chatenay.—Double. This is the finest double white lilac which has bloomed here. The trusses are of good size and the flowers double, pure white and of good substance. It is a most attractive variety and should be in every collection. Another double white variety called Madame Casimir Perier is said to be better, but this has not bloomed here yet.

S. vulgaris, Charles Baltet.—Double. A very free blooming variety with large flowers which are purplish lilac in the centre and approaching a pink shade towards the outside. Blooms in the last week of May.

S. vulgaris, La Tour d'Auvergne.—Double. This variety is at its best when part of the flowers are open and some still in bud, as there is a great contrast in the colour of the bud and the expanded flower. There are several shades of lilac in this variety, varying from light to dark. Blooms in last week of May.

S. vulgaris, Comte Horace de Choiseul.—Double. A free blooming double variety with a compact truss and attractive lilac flowers. Blooms in the fourth week of May.

S. vulgaris, Alba Grandiflora.—Single. This is a great improvement on the common white lilac, being a much freer bloomer and having a large truss and larger flowers. Very good. Blooms during the fourth week of May. Frau Bertha Damman is another fine single white variety.

S. vulgaris, Dr. Maillot.—Double. This is the latest flowering of all the varieties of *S. vulgaris* which have blossomed here and is one of the best. It is a free blooming variety with large trusses and exceptionally large double flowers of a very delicate pinkish purple. At its best during the first week of June. Very desirable for keeping up a succession of bloom.

Syringa oblata, Lindl.—This species was introduced to cultivation in 1859 and is a native of China. The foliage of this lilac is very attractive, the leaves being large and of a dark, glossy green colour ; their shape also differs very much from other species, being heart shaped. The flowers are not unlike those of the common lilac, but have more of a pinkish tinge than most of the varieties of that species. Desirable on account of its attractive foliage. There is said to be a white variety of this species, but it has not yet been tested here.

Syringa persica, L. (Persian lilac).—This species, as its name indicates, is a native of Persia, and was introduced to cultivation in 1640. It is not as robust a grower as the common lilac nor evidently as hardy, having gradually died out at the Experimental Farm. It is a small growing species, usually only reaching a height of five or six feet. The leaves are smaller than those of the common lilac which give it a more graceful habit. The flowers are of a bluish purple colour, not particularly attractive, and are borne in loose panicles. This species blooms during the fourth week of May while the common lilac is still in flower. There is a white and a cut-leaved variety, neither of which have yet done well here.

Syringa chinensis, Willd (Rouen lilac).—Thought to be a hybrid betwen *S. persica* and *S. vulgaris,* of which it has more the character of the former. It was introduced in 1795. Other names for this lilac are *S. rothomagensis* and *S. dubia.* This is a beautiful species, being a much stronger grower than *S. persica* and having better coloured flowers. It grows from six to eight feet in eight and has foliage intermediate in character between *S. persica* and *S. vulgaris.* It is a very free bloomer, the flowers being borne in large, loose panicles and are of an attractive purplish violet colour. It blooms a little later than the Persian, but at the same time as some of the varieties of the common lilac.

Syringa Josikœa, Jacq. Josika's lilac.—Closely following the common lilac in time of blooming is this species, which is a native of Hungary, introduced to cultivation in 1835. If this species flowered at the same time as the common lilac it would

not be as valuable, but it begins to bloom about the 1st of June when most of the varieties of the common lilac are over. It is a robust species and attains a height of ten feet. The foliage is deep green and the leaves large, thick and very glossy, making it quite attractive. The flowers are bluish purple and have no perfume and are not borne in as large trusses as the common lilac. This is a desirable species on account of its giving a succession of bloom and for its fine foliage ; it also makes a very good hedge plant, forming a stiff row and being very attractive on account of its glossy foliage.

Syringa Bretschneideri.—This is a species somewhat resembling *S. persica,* but is more upright in growth, more vigorous and hardier and with handsome foliage. By some authorities it is said to be *S. Emodi rosea* It is, however, quite distinct from anything else growing here. It is not of special merit as it blooms about the same time as some of the best varieties of the common lilac. The flowers are somewhat the same colour as the Persian, being a bluish purple.

S. villosa, Vahl.—A native of Northern China, and introduced in 1880. It is a strong grower and said to reach a height of six feet, though from present indications it will grow a little taller than that here. The leaves are rough and rather coarse looking, but this tends to make the shrub more striking. It flowers during the second week of June, closely following *S. Josikœa.* It is a free bloomer, the flowers, which are not highly perfumed, being pale bluish pink and the clusters of good size. This is a very desirable species.

Syringa Emodi, Wall.—A native of the Himalayan mountains, and introduced in 1840. There is very little difference between this and *S. villosa* as grown here, although those labelled *S. Emodi* have not proven so hardy and the leaves are larger. There is a variety, *rosea,* of this species and also one with variegated leaves.

Syringa pekinensis, Rupr.—This species is a native of Northern China, and was introduced in 1886. It is also sometimes called *Ligustrina pekinensis,* Regel. This species has not bloomed here nor proven perfectly hardy so far. There is a pendulous variety of it.

Syringa amurensis, Rupr.—A native of Manchuria and Japan, and introduced in 1863. It is a strong growing shrub and might be called a small tree, as the tendency is to have only one stem. It is of a moderately spreading habit and has attractive, clean looking foliage. The flowers are quite different from most of the other species, the individual blooms more resembling those of the privet. They are creamy white and borne in large, loose panicles, and also in smaller and more compact ones. This lilac begins to bloom about the beginning of the fourth week of June and is very striking.

Syringa japonica, Decne.—The Japanese lilac, sometimes known as the tree lilac, is a native of Japan, as its name indicates, and was introduced in 1885. It is very similar in habit of growth to *S. amurensis,* as grown here, the panicles of flowers, however are larger and more compact. It blooms more than a week later than that species, not being at its best until the first week of July. Both this and *S. amurensis* are very desirable. These close the lilac season.

Chemical Laboratory, Central Experimental Farm, Ottawa, Ont.

REPORT OF THE CHEMIST

(FRANK T. SHUTT, M.A., F.I.C., F.C.S., F.R.S.C.)

OTTAWA, December 1, 1901.

Dr. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the fifteenth annual report of the Chemical Division of the Experimental Farms. It will, I believe, be found to contain much of interest and value to the Canadian farmer, dairyman, and fruit grower. As formerly, the investigations carried on by this Division and now reported upon, though necessarily of a scientific nature, have been undertaken with the object of obtaining information of a practical character, and in this respect we have met with a very fair measure of success. The researches and analyses made relate to many of the various branches of agriculture, and hence our results should be found useful to a wide circle of readers.

As it would be quite impossible to give a detailed account of all the work accomplished in the Farm laboratories, we have inserted only the results of those investigations of greater importance and general interest, and which in a measure may be said to be completed. The nature and scope of the work is outlined in the following summary.

Soil Investigations.—These include the complete chemical analysis of certain representative soils from British Columbia, Ontario, Nova Scotia, and Prince Edward Island. The most important of the series examined, perhaps, are the examples from reclaimed marshes at the head of the Bay of Fundy. Among other interesting features, certain differences in character and composition between the newly deposited soils and those which have been for many years in cultivation, have been pointed out.

Soils representative of the Spallumcheen Valley, Okanagan, B.C., have been submitted to careful analysis, and suggestions made regarding the culture and maintenance of fertility of this most productive area.

A special examination for lime has been made in certain instances, to ascertain if there were any deficiency in this element. Soils from British Columbia and Quebec are reported on in this connection.

In connection with the question of the conservation of soil moisture, we instituted this year a series of experiments in the orchard of the Central Farm, Ottawa. The moisture was determined in the soil, (*a*) under cover crop, and, (*b*)under cultivation, to a depth of 14 inches once a fortnight throughout the season. The results are as interesting as those obtained last year from the soils on the Experimental Farms at Indian Head, N.W.T., and Brandon, Man., though differing somewhat in character, and will be found useful towards an understanding of the best modern methods of orchard tillage.

Fertilizers.—The substances reported upon under this caption are chiefly of the order which we have in previous reports designated as 'naturally occurring,' and include mucks, muds, limestone, factory wastes, wood ashes, sea-weed, &c.

Fodders and Feeding Stuffs.—The larger part of the work of the year has been in connection with these materials. We are, consequently, able to present results on the following important problems:—1. The changes in the composition of roots during storage. 2. The food and fertilizing values of the yields obtained from clover and

alfalfa by two and four cuttings, respectively. 3. The feeding values of (*a*) corn, and (*b*) clover, before and after ensiling. 4. The amounts of dry matter and sugar in farm roots.

In addition to the foregoing, we have examined sugar beets grown in the North-west Territories, Manitoba and Prince Edward Island.

The recent increase in the price of meals and 'concentrates' in general has caused a keen interest on the part of farmers and dairymen in the comparative feeding values of the various milling by-products upon the market and much correspondence has been received on this subject. There is a desire on the part of many feeders to have the composition of the high-priced by-products—as regards protein and fat contents—stated by the manufacturers. It may be remarked that in several of the United States a law to this effect is in force, and the request appears to be a reasonable one. If it is considered desirable or necessary to afford protection to the purchaser of plant food in commercial fertilizers, it may well be argued that it is equally desirable and necessary to protect the interests of those buying animal food in the more expensive forms (gluten meal, &c., &c.) now coming into such extended use. In tabular form we present the analytical data obtained on a series of samples of germ meal, gluten meal and other important by-products in the manufacture of corn starch and glucose, examined in the laboratories here during the past year. Many of these materials are seen to have a high feeding value, but a consideration of the whole shows that there is sufficient difference in their nutritive qualities to make this inquiry one of importance.

Insecticides and Fungicides.—Analyses have been given of several brands of lye used in Canada and recently examined by us, as well as of certain other compounds used in the preparation of spraying mixtures.

Soft Pork Investigation.—The analytical work in connection with this research was brought to a close in May of the current year. The compilation of the data, which were very voluminous, and their consideration necessarily occupied a considerable time, so that it was well on in the year before the results and the deductions therefrom were ready for the press. We are glad to state, however, that in Bulletin No. 38, of the Farm Series, our conclusions from this important investigation have now appeared and been distributed. It is gratifying to note that this work has received the commendations of many engaged in pig raising and the pork packing industry, as well as the agricultural press.

Grass Pea (Lathyrus sativus).—It being held by some that the seed of this plant, which is now somewhat extensively grown in parts of Ontario, possessed poisonous qualities, a very thorough search was made by chemical means, but with negative results. This pea was also fed, almost exclusively, under our immediate supervision for some weeks to fowls, but no injurious effects could be observed.

Well Waters from Farm Homesteads.—A tabulated statement is given of the data obtained upon the samples submitted to analysis, together with a brief report as to the wholesomeness of the waters. It is gratifying to note that on comparing these results with those of former years, there appears to be a decided improvement in the quality of farm waters.

It seems again necessary to point out that instructions as to collection and shipment should be obtained before sending samples, in order to avoid mistakes that frequently render the analysis valueless.

Investigations in Progress.—A considerable amount of work has been done on the analysis of honey, chiefly with the view of distinguishing between ripe and unripe samples. It has been discovered that the ordinary analytical methods in vogue for determining the percentage of water in this article are defective and do not yield accurate results. Further work is necessary, and it is confidently hoped that during the coming year we may be able to perfect our processes. We shall then be in a position to furnish reliable information as to the composition of Canadian honey and to ascertain what differences may exist between the ripe and unripe product.

Another matter receiving attention is the comparative feeding value of fodder corn grown in hills and drills, respectively. Four well known varieties with this end in view are now in course of analysis.

Tuberculin.—We have, as in former years, prepared and forwarded tuberculin to the Dominion veterinary surgeons. During the twelve months ending November 30, 1901, 6,780 doses have been sent out.

Correspondence.—The letters received by this Division, in addition to those referred to us by the other departments of the Farm, numbered 1,213, from December 1, 1900, to November 30, 1901, and during that period 1,127 were despatched.

Samples Received for Analysis.—In the subjoined table will be found information as to the number and character of the samples received for examination. The number exceeds that of past years, and points to the popularity of this branch of work. As the demands upon our time increase, it is necessary to point out that the examination of such samples can only be undertaken as opportunity permits, and that the experiments instituted on the farm must, necessarily, have first attention. As far as is possible, help will be furnished as heretofore in this matter, but we must counsel patience and consideration on the part of our correspondents.

SAMPLES Received from Farmers for Examination and Report, November 30, 1900, to December 1, 1901.

Samples.	British Columbia	North-west Territories.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	20	4	2	72	15	5	5	4	127	27
Mucks, muds and marls	3	....	1	6	2	....	12	15	39	11
Manures and fertilizers	1	1	...	3	....	1	7	4	17	3
Forage plants and fodders	1	5	15	111	1	....	2	18	153	2
Well waters	3	3	14	37	10	12	2	15	96	0
Miscellaneous, including dairy products, fungicides and insecticides	2	7	2	40	11	1	4	2	69	9
Totals	30	20	34	269	39	19	32	58	501	52

Acknowledgments.—To the assistant chemists, Mr. A. T. Charron, M.A., and Mr. H. W. Charlton, B.Sc., I would again heartily tender my thanks for much valuable assistance during the past year. By their assiduous labours and their intelligent interest in the various investigations, has it alone been possible to overtake the work of this Division and to present the information contained in this report.

I am also much indebted to Mr. J. F. Watson, for most efficient help in connection with the correspondence and other clerical work of the Chemical Division. As in past years, his duties have been performed in a most careful and painstaking manner.

I have the honour to be, sir,

Your obedient servant,

FRANK T. SHUTT,

Chemist, Dominion Experimental Farms.

SOIL INVESTIGATIONS.

BRITISH COLUMBIA.

Spallumcheen Valley.—Our attention having been directed to the desirability of ascertaining the nature and possible deficiencies of the soil of this district, we obtained through the kindness of Mr. Donald Graham, of Armstrong, B.C., two samples, representative of the surface and subsoil, and accompanying which we received the following particulars and information. Mr. Graham writes: 'The two samples represent the Spallumcheen Valley as a whole. The soil was originally very rich and productive. It is still strong, although certainly failing somewhat in productiveness. We should like to know what it requires particularly to bring it up again, though perhaps not so much to bring it up as to keep it from failing any more. No. 1 is a black loam and covers this valley generally from a very slight covering in places to a depth of sometimes a foot or two. It has been cultivated for the past twenty years. No. 2 is the subsoil of the valley, but in places where coming to the surface it has been productive, although much harder to cultivate than No. 1. In such parts of the valley where there is not much (surface) loam, the soil is getting yearly harder to cultivate. The sample sent was taken from beneath the black loam forwarded, at a depth of a foot or more, and consequently I presume it to be richer than the clay that has been reached by the plough and cropped.'

Analysis of (air-dried) Soils.

	No. 1. Surface soil	No. 2. Subsoil
Moisture	3·80	3·81
Organic and volatile matter	12·28	7·70
Clay and sand (insoluble in acid)	65·46	63·51
Oxide of iron and alumina	15·80	21·15
Lime	·69	·82
Magnesia	·09	1·21
Potash	·83	1·09
Phosphoric acid	·23	·16
Soluble silica	·09	·05
Carbonic acid, &c. (undetermined)	·73	·50
	100·00	100·00
Nitrogen in organic matter	·415	·161

Available Constituents in Surface Soil.

	p. c.
Potash	·029
Phosphoric acid	·028
Lime	·316

No. 1. The chemical data give evidence of a high degree of fertility. Judged by the standards suggested by Dr. Hilgard, as well as those we have previously established from the examination of Canadian soils, I should conclude that this soil was well supplied with all the more important constituents of plant food. Indeed, it appears to the writer as a soil of more than average richness.

Further, the proportion of the mineral elements potash, phosphoric acid and lime, more or less immediately available, are very satisfactory, so that with a sufficient supply of moisture excellent crop yields should be obtained.

Towards the maintenance of its fertility we should counsel the application from time to time of an organic manure, and in this connection the growth and turning under of clover in districts where there is sufficient moisture to obtain a good 'stand,' offers itself as one of the most economical methods. The growth of the clover would no doubt be encouraged, and the land much improved, by a dressing of a fertilizer con-

taining lime and potash. Since marl (carbonate of lime) is obtainable in the neighbourhood, it might be tried, though if first burnt its effect will be more immediate. The continued or excessive use of quick lime, especially if unaccompanied by other manures, is not to be recommended, for though such treatment might give larger yields for a few years, it would tend eventually to exhaust the soil. The value of clover as a fertilizer has in past reports been fully dealt with in all its phases, and it is only necessary to remind our readers that clover is a moisture-loving plant, and consequently it is practically impossible to ensure its vigorous growth unless the soil contains a sufficiency of moisture. It is possible that alfalfa, being a deeply-rooted legume, might give a better return than clover, but being of a slower and somewhat more difficult growth, it does not offer itself as a desirable substitute for the purposes of 'green manuring,' when the land is being worked under a short rotation. The question of rotation is also one that has much to do with the maintenance of fertility, for there is no doubt that land continuously under one crop—and especially one demanding the active cultivation of the land and making great demands on the store of available plant food—will fall off in productiveness much more quickly than one under a system which calls for a due succession of crops.

The physical texture of this soil, judged from the sample forwarded, appears to be excellent, no doubt due largely to the favourable proportion of organic matter present. A mechanical separation shows, approximately, 55 per cent of coarse sand—a fact that places it in the category of soils well adapted to general cultivation.

No. 2. In the larger number of the determinations this subsoil shows that plant food is abundantly present, though the fact that the soil bakes into hard masses indicates that drainage is desirable, and that a dressing of lime would be beneficial.

ONTARIO.

Welland County.—Two samples of soil from South End, Welland county, and which were fairly representative of the cultivated lands of the district, have been examined with a view of obtaining information as to their character, their possible deficiencies and most economic methods of treatment. Most of the soils in this district—which has long been favourably known as adapted to fruit growing—have been tilled for a number of years, and consequently where not kept up with manures they are to be considered as 'partially exhausted.' It is of the latter order that the soils examined are to be considered.

Our correspondent in forwarding the samples furnishes the following particulars regarding them:—'No. 1. This has been in grapes for several years, perhaps twelve. To my knowledge it has not received any manure or fertilizer for at least four years, and probably for a still longer period. It has been well cultivated. It would average about one foot in depth, and is underlaid by a heavier clay. No. 2 was cropped—blue grass and timothy—three or four years prior to 1897, when it was ploughed and sown to fall wheat; crop, 20 bushels to the acre, 1898. Oats, 1899, potatoes and turnips, and trees (orchard) planted in 1900 with no crop, but well worked. Subsoil, clay, as in No. 1.'

Analysis of (air-dried) Soils.

	No. 1. Grapery.	No. 2. Orchard.
Moisture	1·23	1·47
Organic and volatile matter	4·91	7·07
Clay and sand (insoluble in acid)	84·25	81·74
Lime	·23	·32
Potash	·35	·39
Phosphoric acid	·10	·11
Nitrogen, in organic matter	·126	·231
Available phosphoric acid	·0112	·0141
Available potash	·0098	·0195
Available lime	·110	·188

A mechanical separation of the clay and sand showed that No. 1 contained 62·70 per cent, and No. 2, 70·00 per cent, coarse sand. They are, therefore, to be considered essentially as sandy loams.

Judged from the chemical standpoint, No. 2 is the better soil, being richer in organic matter and nitrogen, in addition to showing somewhat larger percentages of lime, potash and phosphoric acid, more especially in the available condition. The reason for the better quality may, perhaps, be found in the well known fact that land under active cultivation loses in fertility much quicker than that in sod—indeed, the latter if pastured, will improve, more particularly in available constituents.

No. 1. The data indicate that as regards mineral constituents this soil is below the average of fairly fertile soils, and that for most crops the application of a fertilizer containing all three elements—potash, phosphoric acid and lime—would prove beneficial. The soil has a distinctly acid reaction, due, no doubt, in large part to deficiency in lime, and, therefore, wood ashes or Thomas' slag and a potash salt are suggested as fertilizers.

No. 2. This soil is of fair average quality and should give good returns. It could, however, be improved by treatment such as suggested in the preceding paragraph.

Speaking generally of such soils, we should say that being somewhat sour and naturally deficient in lime, an application of lime—or, better still, a fertilizer furnishing not only lime, but also phosphoric acid and potash—would be advantageous. As a source of phosphoric acid, Thomas' or basic slag could be advised.

Further, to improve tilth and absorptive capacity for moisture, both soils, but especially No. 1, would be the better for an organic manure, and especially one which would at the same time increase the store of nitrogen. The growth and turning under of clover furnishes an economical means to that end.

NOVA SCOTIA.

Marsh Soils from the Bay of Fundy.—Among the most valuable and fertile soils of Nova Scotia and New Brunswick are the reclaimed salt marsh lands which border on the Bay of Fundy. Many of these have produced, for a long term of years, without the application of any manure, remunerative yields of hay, and consequently are soils justly esteemed in the maritime provinces as of the highest agricultural importance. Besides their suitability for the raising of hay, many, no doubt, by reason of their composition and texture, are capable of giving profitable returns in ordinary field and market garden crops.

The salt marsh areas, before being dyked and drained, may present one of several aspects. Frequently they appear as bare deposits of tidal mud, the depth of which may be many or only a few feet. This is generally full of the undecomposed remains of eel grass (*zostera marina*), a plant of little direct agricultural value, but of the greatest service in the formation of these marshes, and in supplying their soils with organic matter. At other places, these marshes are found covered with a thick, matted sod resulting from the growth of salt grasses that followed the eel grass and overlying the tidal deposit.

Dyking to keep out the sea-water, and thorough drainage to remove the salt and excess of water, are the two initial processes necessary towards reclamation. Once these are effectively accomplished, the land is easily brought into cultivation, and is found, as already stated, to be most productive. It is the practice of some farmers to occasionally let in the tide for a short period, so that the soil may be recovered for a time. This plan, though it rejuvenates the soil, necessitates the lapse of a year or two, to allow the washing out and carrying away of the salt with which the sea water has impregnated the land. Marshes from which the salt has not been removed will not grow timothy, and the quality of the salt grasses produced is of a decidedly inferior character.

In several of the past reports of this Division, analyses have been given of the marsh 'mud' as deposited by the tide, and which is very generally used on all lands adjoining the Bay of Fundy, as an amendment or fertilizer. Hitherto, however, we have not had the opportunity of making any systematic examination of the soils of the reclaimed marshes. This important work has, through the co-operation of Professor Wm. F. Ganong, been partially accomplished during the past year, and the analytical results obtained are here presented.

The samples, five in number, were collected and forwarded by Professor Wm. F. Ganong, who for some years past has been making a critical study of the reclaimed salt marshes which lie at the head of the Bay of Fundy. It was thought by him that there might be some relationship between the character and composition of these soils—which have all been deposited by the tide—and their vegetation, and that a knowledge of this relationship might be of economic, as well as scientific, value. Recognizing the significance of this conjecture, and knowing that large and important agricultural interests are closely identified with these reclaimed marshes, both in New Brunswick and Nova Scotia, the analysis of these soils was undertaken. The data are not only exceedingly interesting from a scientific standpoint, but are of value in indicating the character of these soils and in furnishing information that may be of use to the practical farmer as to the best treatment of these marshes.

The following particulars are furnished by Professor Ganong :—

Description and Location of Soils.—No. 1. Marsh land. From near Aulac river, opposite Pointe de Bute. Has yielded heavy crops of timothy and associated grasses for at least forty years without ploughing, tiding, fertilizing or other cultural treatment.

No. 2. Soil from low part of marsh producing very poor grass. Patches surrounded by very good grass. Near Missequash river, opposite Pointe de Bute. Here and there on the good marsh are areas of a few square yards on which there is a poor growth, and this No. 2 is a sample from one of these. Deposit very deep, known to be twenty feet or more.

No. 3. Mud freshly brought in and laid down by the tide at mouth of Tantramar river, on a piece of marsh being newly 'tided.' A sample of the deposit of which the entire marshes are built ; the original marsh material unaffected by any vegetation.

No. 4. Blue clay, from 18 inches below the surface in a damp place inside the company's canal, near Missequash river, above Pointe de Bute. The red mud changes to this where drainage is poor. It then bears a coarse, nearly useless, vegetation. Deposit, many feet deep. Extremely poor soil and needing improvement.

No. 5. Brown mud, from 2½ feet below the surface, inside the company's canal, near Missequash river, above Pointe de Bute. Being thus below the surface, this soil has never borne crops directly, though it is penetrated by roots of the grass on the ordinary cultivated marsh land above. Deposit is many feet deep.

On arrival at the laboratory, the following notes were made on the samples, all of which were in an air-dried condition :—

No. 1. Of a distinctly red colour ; in small lumps easily broken between the finger and thumb, and containing a considerable amount of root fibre. For a marsh soil, it has the appearance of being in a very fair mechanical condition, though possibly it might be improved in this respect by drainage.

No. 2. In larger and less friable lumps than No. 1, of a grayish-blue colour with streaks of reddish soil through them. The colour and condition point to insufficient aëration, resulting no doubt from the drainage being imperfect.

No. 3. In layers something like shale, one-eighth to one-fourth inches in thickness, distinctly red, and easily broken. Has more the appearance of a rock than a soil.

No. 4. In exceedingly hard, tenacious lumps, bluish-gray, but showing many streaks of a greenish-yellow colour.

No. 5. In reddish lumps, easily broken. Not unlike sample No. 1, but not showing any root fibre.

The samples for analysis were made on the 'fine earth' prepared by first removing all fibre and pebbles and then grinding and seiving the remainder. In the determination of the 'total' constituents, hydrochloric acid, specific gravity 1·115, was used as a solvent, digesting the soil for 10 hours at the temperature of the water-bath. For the estimation of the 'available' potash, phosphoric acid, and lime, 1 per cent solution of citric acid was employed, digesting in the cold for 5 hours with frequent agitation.

CHEMICAL Analyses of Soils from the Head of the Bay of Fundy, 1901. Results calculated on water-free Soils.

No.	Organic and Volatile Matter.	Clay and Sand.	Oxide of Iron and Alumina.	Lime.	Magnesia.	Potash.	Phosphoric Acid.	Soluble Silica.	Carbonic Acid (undermined).	Total.
1	6·54	75·29	14·72	·239	·513	·817	·136	·091	1·654	100·0
2	10·60	73·18	12·64	·234	·397	·852	·124	·059	1·914	100·0
3	6·02	75·83	13·79	·652	·283	·902	·146	·063	2·314	100·0
4	6·77	76·01	14·01	·409	·183	·996	·094	·056	1·472	100·0
5	3·10	84·48	9·87	·288	·154	·646	·110	·063	1·289	100·0

No. (Continued.)	Nitrogen.	Available Elements.			Reaction.
		Potash.	Phosphoric Acid.	Lime.	
1	·182	·0088	·0260	·0626	Acid.
2	·338	·0340	·0160	·0449	"
3	·122	·0748	·0466	·3970	Neutral.
4	·106	·0073	·0436	·0792	Acid.
5	·062	·0300	·0354	·1080	"

The data in the subjoined table have been furnished by Professor Ganong. They give the proportions of the various soil-forming constituents in the example under investigation.

Mechanical Analyses of Marsh Soil.

—	I. Timothy land unploughed and cropped over 40 years	II. Low places in hay marsh where agrostis grows.	III. Brought in fresh by tide.	IV. Blue clay from 18 in. below surface.
Water	2·200	2·600	1·800	3·160
Organic matter	6·505	10·920	6·200	7·360
Gravel	·025	....	1·125	·125
Coarse sand	·275	·400	3·100	·325
Medium "	4·125	·285	2·025	2·400
Fine "	9·360	1·900	4·225	6·210
Very fine "	22·185	1·300	45·275	33·885
Silt	36·165	50·110	14·125	20·375
Fine silt	10·390	17·735	12·400	10·865
Clay	8·585	10·530	9·660	15·200
	99·815	95·780	99·935	99·905

The proportion of Salt in Marsh Soils.—Since the fertility of marsh depends in a large measure upon the thoroughness with which the common salt has been eliminated, a determination of this constituent was deemed advisable. The percentages obtained are as follows, and represent the amounts present in the water-free soils :—

	Common salt per cent.
No. 1	·037
No. 2	1·048
No. 3	4·16
No. 4	·939
No. 5	·217

Conclusions and Suggestions.—No. 1. As regards humus (organic matter) and nitrogen, this soil would compare well with those of fair average richness, the percentages of nitrogen in such usually being between ·1 and ·2 per cent.

The lime-content agrees with that found in many Canadian sandy loams of average fertility, which as a rule lies between ·1 and ·3 per cent. It cannot, however, be considered as rich in this constituent.

The total potash in this, as in the other members of the series, is much higher than in most of our virgin soils. It most probably exists in the form of double silicates, and would be gradually liberated in an assimilable condition under good methods of soil culture and favourable climatic conditions.

The percentage of phosphoric acid is somewhat lower than that in Canadian virgin soils of average fertility, but as we shall see shortly, a large proportion of this is in an available form.

This soil, as also Nos. 2, 3 and 4, is characterized by a large percentage of oxide of iron a feature that frequently betokens, when the iron is fully oxidized (by aëration which follows efficient drainage and good cultural methods), a favourable condition for plant growth.

The immediate fertility or crop-producing power of a soil as contrasted with that which is latent, is measured by the percentages of the essential elements necessary for plant nourishment that are available, rather than by the percentages extracted by hot hydrochloric acid—the solvent employed in the usual methods of analysis. The amounts of the so-called available elements are obtained by using an acid solution which is approximately equal in solvent power to that exuded by the roots and rootlets of plants. Such a solvent is a 1 per cent solution of citric acid.* By this method, known as the Dyer method, after the chemist who introduced it in 1894, this soil (No. 1) appears to be fairly well supplied in available phosphoric acid, but somewhat below the average of fertile soils as regards available potash, probably resulting from its removal by the hay crop during the long term of years the marsh has been cut. Further, it seems probable that this soil is somewhat deficient in its store of available lime.

In character, it may be classed as a sandy loam, containing fair proportions of clay and organic matter.

It is exceedingly interesting and satisfactory to note that in this soil the salt has been so thoroughly washed out. Of all the samples it contains the least. The extent to which this removal has taken place will be evident on comparing the percentage in this soil (·037) with that in No. 3 (4·16), which is newly laid down marsh.

Considered generally, we might prejudge the soil as one capable of yielding good crops under favourable climatic conditions, but one also that might have its productiveness increased by occasional manurings and thorough drainage where necessary to

---

*A full discussion of the character of many Canadian virgin soils, standards of fertility and methods of analysis, is to be found in the Report of the Chemist of the Experimental Farms, 1897.

improve its mechanical condition. Were we asked to make suggestions regarding the nature of the manures to be used we should advise, since it is hay land, the sowing of clover from time to time, which would enrich the soil in humus and nitrogen, and a dressing of bone meal 200 pounds, superphosphate 100 pounds, and muriate of potash 75 pounds, these quantities being for one acre. It is quite probable that a simple dressing of lime, 20 to 40 bushels per acre, might much increase the yield.

No. 2. Though in many features this soil is similar to No. 1, there are certain data which show it to be richer in plant food. Thus, in nitrogen and organic matter, the percentages are almost double those in No. 1. It is also much richer in total and available potash. The phosphoric acid, however, present in the available condition is considerably less than in the preceding sample.

With better drainage, through aëration, and good culture, this soil should give returns equally as good as those from No. 1. There is no evidence of any particular want of plant food or of the presence of any deleterious compounds, save those which naturally form in a water-logged soil from which the air is excluded.

We are of the opinion that in addition to drainage and aëration, an application of lime would prove of benefit, sweetening the soil and converting the poisonous iron compounds, formed by the causes mentioned in the preceding paragraph, into innocuous forms.

The comparatively speaking large amount of salt present strongly indicates poor drainage, and serves to support the view taken that the requirements of this soil are mechanical rather than chemical.

No. 3. This sample is of particular interest as furnishing data regarding the composition of the tidal deposit as laid down. It seems to contain both mineral and organic constituents in very fair quantities, and gives evidence of possessing all the requisites for forming a good arable soil under suitable treatment.

On comparing the amounts of the organic matter and nitrogen of freshly deposited marsh with those of old marsh soil (No. 1), it will be observed that the latter is somewhat the richer in these constituents. This agrees with the generally accepted view, that in soils under sod continuously the percentages of humus and nitrogen tend to increase.

The percentage of lime is nearly three times that in soils Nos. 1 and 2, and seems to indicate that the 'mud' as deposited is richer in this element than the marsh lands are after years of cultivation. If this is the case, an explanation is furnished in the fact that a considerable quantity is annually withdrawn by the crop. We, further, are aware that lime has a tendency to 'work down' into the subsoil. This soil, it will be noticed, is the only one of the series that does not show acidity, a very significant fact.

The amount of salt, as might be expected, is very high. That, however, it can be readily removed through drainage has been already shown.

No. 4. While the percentages of plant food, with the exception of potash, are not equal to those of many soils of good average fertility, there are no undesirable features save the 'sourness' of the soil and its very bad mechanical condition, both of which are capable of removal or improvement by drainage, aëration and the application of lime. Its chief deficiencies, if such they may be called, are nitrogen and phosphoric acid.

The necessity for better drainage is emphasized by the amount of salt present, nearly 1 per cent.

No. 5. From the position of this sample, it must be regarded as of the nature of a subsoil, and consequently its very small percentages of nitrogen and organic matter are not to be considered as abnormal. This sample presents many similarities to the other soils of this series, though there are notable differences between this and the four preceding soils in the much smaller percentage of oxide of iron it possesses.

PRINCE EDWARD ISLAND.

Marsh Soil.—Respecting this reclaimed land, the inquiry is received: 'Will timothy and clover thrive upon it?' Mr. Richard Egan, of Mount Stewart, P.E.I., in sending the marsh soil for analysis says: 'The land was formerly flooded by salt water. Some three years ago an aboideau was constructed, and for two years after good crops of marsh hay were taken from it. Now there is hardly any crop—the marsh grasses are apparently dying. There are over 500 acres of this land owned by different farmers, who are at present suffering a great loss.'

When received, the sample consisted of granular masses and a small amount of powder, of a light gray colour, mixed with many fragments of vegetable fibre, chiefly of eel grass. From the appearance and construction of the soil particles it would seem as if they were formed by the deposition of a fine silt about the partly disintegrated fibre. The whole was of a very loose, light texture.

To ascertain, if possible, the cause of the alleged sterility, we made an examination of the soil and obtained the following data:—

Analysis of (air-dried) Marsh Soil.

Moisture	3·29
Organic and volatile matter	15·79
Mineral matter, insoluble in acid	60·10
Mineral matter, soluble in acid	20·82
	100·00
Lime	·31
Nitrogen	·45
†Common salt	·31
*Sulphate of lime	·93

†Calculated from chlorine. *Calculated from sulphuric acid.

It would appear from these figures that as regards nitrogen and humus there is no deficiency; indeed, the amounts present show that in these constituents the soil is particularly rich, though no doubt much of the nitrogen is not in an assimilable condition.

No determination of the percentages of the potash and phosphoric acid present was made, but we feel assured from past work upon virgin marsh land that the trouble cannot be due to lack of these elements.

The amount of lime, ·31 per cent, indicates that this element is not wanting.

The soluble chlorides and sulphates (common salt, sulphate of lime) present, though not excessive, would suggest the desirability of more thorough drainage if timothy and clover are to be sown. Possibly a fair growth of the cultivated grasses could now be obtained, and every succeeding season, provided the showers can wash out and carry away the salt, the conditions for their development would be improved.

The skilful culture or working of the land, in addition to drainage, would no doubt assist in bringing about that texture or mechanical condition of the soil necessary to the vigorous growth of timothy and clover. At present it seems to be too light and porous, and though these qualities are conducive to the sweetening and aëration of the soil, a firmer and more compact tilth is desirable for cultivated grasses. To this end it might be desirable to cultivate the land one or two seasons with a root crop, furnishing sufficient manure to give the young plants a good start.

There is another course open, but it means the growing of the coarser, less nutritious salt grasses. If the marsh were flooded, the probability is that much of the apparently dead marsh grass would revive, and in a season or two a good crop of hay procured. This method would, of course, preclude the possibility of growing timothy and

clover, and we should therefore advise a careful scrutiny of the marsh and the trial of timothy and clover on the better drained portions, before resorting to the latter plan and letting in the salt water. Though possibly there may be marked differences in the qualities of these tidal deposited soils, we do not know of any instance where the land has not yielded to a proper and thorough system of reclamation, giving remunerative crops of cultivated grasses as soon as the salt has been sufficiently washed out and the soil become well aërated and, in such cases as this, well compacted.

SOILS EXAMINED FOR DEFICIENCY IN LIME.

Many soils are received respecting which information is merely sought as to their richness in lime, so that their future treatment as regards this form of plant food may be in accord with the best practice. These samples, as a rule, are tested qualitatively, and from the results obtained an opinion is forwarded as to the necessity or desirability of a lime application. Occasionally, however, when these soils are representative of large areas they are submitted to a quantitative analysis, estimating the total lime, and also the proportion soluble in 1 per cent citric acid, which we must suppose indicates approximately the amount readily available to plants. We may insert the analysis of a few of these, since the placing on record of the data will make them available for future reference.

Labelle County, Quebec.—Three clay soils sent by the Hon. W. Owens, Montebello, and considered as deficient in lime:—

	Total Lime.	Available Lime.
No. 1	·462	·448
No. 2	·791	·089
No. 3	·679	·116

No. 1. This appears to be a fairly good soil, though capable of improvement, probably by judicious culture. It contains a considerable amount of humus (organic matter) and nitrogen, and I should judge, is by no means deficient in the other elements of plant food.

Regarding its lime content—the chief object of this inquiry—our results show a fair, though not large, percentage. Analysis further indicates that by far the larger quantity of this lime is in a more or less readily available condition. Though one cannot speak positively, the data do not indicate that the soil stands in need of a dressing of lime.

No. 2 and No. 3. Clay loams are similar soils, though I should consider the latter somewhat the more refractory of the two. Both, in my opinion, would be benefited by an organic manure (barn-yard manure or clover turned under) and an application of lime. It will be noticed that, though these soils contain a larger percentage of total lime than No. 1, their percentage of available lime is very much less. They give a faintly acid reaction to litmus paper, a fact which confirms the deduction from the available lime estimation. From a mechanical as well as a chemical standpoint, I think lime would improve these soils.

Enderby, Kamloops Division, E. Yale, B.C.—The soil is a stiff clay, and is described by Mr. Frank Hazard, who sends the sample, as 'rich wheat land, giving heavy crops.' It is, however, 'very difficult to work, and can only be ploughed in dry weather. It breaks down with the frost.' When received at the laboratory, it had dried into hard, refractory lumps and masses. Information is sought as to what may be added to the soil to improve its texture and render it more easily worked.

A partial analysis afforded the following data:—

Moisture	7·18
Organic and volatile matter	10·59
Oxide of iron and alumina	24·68
Lime	1·21
Nitrogen in organic matter	·301

An estimation of the lime soluble in 1 per cent citric acid solution gave ·075 per cent.

As regards nitrogen, the soil must be considered much above the average, and this fact no doubt in a large measure accounts for the high productiveness of the land and its suitability for wheat growing. It is also very well supplied with organic matter. In lime, the percentage obtained by using hot, strong hydrochloric acid as a solvent, is by no means insignificant, but that a very small proportion exists in an active and assimilable condition is evident from the small proportion soluble in dilute citric acid, viz., ·075 per cent.

It seems, therefore, from our examination that this is to be considered a rich soil, but one that might be improved by thorough drainage, careful working and the judicious use of lime. An application of this 'amendment,' say, at the rate of 40 bushels per acre, harrowed under, would, we believe, increase the soil's productiveness, and in conjunction with drainage, weathering and 'dry' working of the land, materially ameliorate its physical condition.

The continued use of lime makes it desirable to supply the soil from time to time with organic matter. This, of course, may be done by an application of stable manure, but when there is only a limited supply of this available it will be advisable to have recourse to the turning under from time to time of a green crop—preferably one of the legumes, such as clover or pease.

THE RELATION OF 'COVER' CROPS AND CULTIVATION TO SOIL MOISTURE.

For some years past there has been a keen interest evinced by the orchardists and fruit growers of Ontario and eastern Canada in the question of cover crops followed by bare cultivation. The subject is being continually discussed as one of first importance in the horticultural press and at fruit growers' conventions, and there is already on record a considerable amount of practical experience, chiefly of a favourable character, regarding this system of soil treatment. The old method of allowing orchards to remain in permanent sod is being abandoned and in its place this plan is being adopted.

With a view to obtaining data that might prove valuable, more especially towards suggesting a rational treatment of orchard soils in eastern Ontario and adjacent areas in Quebec, we have, with the co-operation of the horticultural division, carried on during the past season certain investigations in the orchards of the Experimental Farm, Ottawa. This work has furnished results of some importance, and will, we think, prove of more than ordinary interest to many of our readers.

We may briefly at the outset state the plan of the system and the principles underlying it.* The land is ploughed in late spring—usually between the latter part of April and the middle of May—and kept thoroughly cultivated until early in July, when one of the legumes, generally mammoth or common red clover, is sown. This, as a rule, is allowed to remain till the following spring, possibly the second or third week in May, when the growth is turned under with the plough and the soil cultivated as many times as is deemed necessary until the beginning of July, when clover is again sown. According to the nature of the soil and the rainfall to be expected in the district, the dates for these operations must be varied somewhat; thus, if drought usually prevails in the early summer months the ploughing under of the clover should not be later than the middle of April—even if there be little or no spring growth—so that by cultivation the spring showers may be conserved. On the other hand, if a generous and well distributed precipitation may be expected the clover may be allowed to remain growing throughout the summer, mowing the crop when necessary. The objects of the system are, primarily, the enrichment of the soil with humus and nitrogen and the conservation of moisture for the use of the trees during the drier months of summer, and incidentally the aëration of the soil and the liberation of its plant food. It also

*For a fuller account, the reader is referred to Bulletin No. 37, Experimental Farms Series, recently written by Mr. W. T. Macoun, Horticulturist, C.E.F.

includes the protection of the tree roots during the winter months. It may also be pointed out that the growth of the clover during the late summer and autumn is expected to utilize soil moisture (that would otherwise serve to keep the trees growing and thus prevent wood duly ripening before winter), and serve to retain the nitrates which might otherwise be lost.

The present investigation was undertaken to obtain data upon one of these features only, viz., relation of cover crop and cultivation to soil moisture. Two areas in the farm orchard were selected and are denoted in the table of results as A and B. The soil on both is light, sandy loam, rather deficient in humus. Particulars as to dates of sowing, ploughing under of the clover, &c., may be briefly stated as follows:—

'A.' In cherry orchard. Clover was sown May 16, 1900, on the plot designated 'Under Crop,' and allowed to remain during the season of 1901.*

The plot 'Cultivated' was planted in 1900 with pease and other vegetables, and in 1901 with vegetables and strawberries. It was constantly cultivated and kept free from weeds throughout both seasons.

For two successive seasons, therefore, the one plot has been in clover, while the other has been kept cultivated.

'B.' In plum orchard. Clover was sown over the whole of this plot on April 28, 1900. On the portion designated 'Cultivated' it was ploughed under April 18, 1901, and the soil cultivated from time to time throughout the season.

The samples of soil, taken every two weeks from May 6 to October 21, 1901, inclusive, were obtained by means of special canisters which secured the soil to a depth of 14 inches. The percentages of moisture and the calculated amounts of water per acre (see table) therefore, represent to that depth the condition of the soil in regard to water-content.

The rainfall statistics have been given, the figures indicating the precipitation during the period between the taking of each set of samples. For practical purposes, an inch of rain means 100 tons of water per acre.

AMOUNT of water, per acre, in soil to a depth of 14 inches (*a*) Under crop and (*b*) Cultivated. Estimations made every two weeks from May 6 to October 21, 1901.

Collection of Sample.	Rainfall.	A.						B.					
		Under Crop.			Cultivated.			Under Crop.			Cultivated.		
		Moisture.	Water per acre (calculated).		Moisture.	Water per acre (calculated).		Moisture.	Water per acre (calculated).		Moisture.	Water per acre (calculated).	
	Inch.	p. c.	Tons.	Lbs.	p. c.	Tons.	Lbs.	p. c.	Tons.	Lbs.	p. c.	Tons.	Lbs.
May 6..	1·33	6·14	130	565	11·55	260	131	9·57	198	520	9·93	206	1,088
" 20..	2·74	12·48	283	1,983	15·03	352	566	15·22	336	472	13·58	294	563
June 3..	2·13	10·99	245	1,798	14·50	337	1,508	14·09	307	347	14·61	321	439
" 17..	1·31	7·29	151	419	13·32	306	88	8·64	177	244	9·30	192	189
July 2..	1·73	4·32	89	1,842	8·84	193	257	8·28	168	1,060	10·76	225	1,646
" 15..	1·26	6·17	130	1,817	9·89	216	374	4·74	93	386	7 99	162	1,291
" 29..	1·37	9·29	203	1,934	14·03	325	39	10·19	212	1,007	15·08	332	1,176
Aug. 12..	4·17	13·63	314	558	13·83	319	1,285	13·58	234	614	15·60	346	329
" 26..	0·29	6·68	142	1,121	8·67	189	14	12·45	266	670	11·08	233	1,876
Sept. 10..	0·52	4·93	103	543	9·73	214	229	4·96	97	1,498	7·96	161	1,963
" 23..	1·68	9·75	214	1,207	11·07	247	1,712	10·57	221	728	12·67	271	1,449
Oct. 7..	1·93	10·54	234	1,288	12·69	239	932	10·67	223	1,417	16·01	357	18
" 21..	0·67	11·76	264	1,715	12·77	290	1,853	13·32	287	1,624	14·99	330	519

*The crop was not ploughed under in spring of 1901, as the soil was considered to possess an abundance of moisture and the enrichment of the soil with humus and nitrogen was chiefly sought.

Plot 'A.' Though during the 24 weeks of the investigation the moisture content is seen to fluctuate considerably, it is invariably greater in the 'cultivated soil.' This is strictly in accord with theory, based on experimental data. The soil in crop loses more moisture by capillarity than that cultivated, and also parts with a considerable amount by transpiration through the leaves of the clover.

The greatest differences, especially during the earlier months, are observable when the precipitation is least. Thus, on May 6, the total rainfall to date was only 1·33 inches, and the excess of moisture in favour of the 'cultivated' land was practically 130 tons per acre. At this time there was a vigorous growth of the clover, and much moisture was consequently being withdrawn from the soil for its development. This teaches an important lesson, as it is from May 1 to the middle of July that we wish particularly the trees to be supplied with all the moisture necessary for their growth. The value of cultivation during this period, if the season is dry, will be proportionally much greater than if there is a fair rainfall. The season of 1901 during its earlier weeks shows a fairly well distributed precipitation, but nevertheless, the data fully confirm this conclusion.

	Rainfall.	Excess of Water, per acre, in cultivated land.	
	Inches.	Tons.	Lbs.
May 6	1·33	129	1,566
" 20	2·74	68	583
June 3	2·13	91	1,710
" 17	1·31	154	669
July 2	1·73	103	1,415

The converse of the proposition considered in the preceding paragraph is also true: The greater the precipitation, the less the difference in moisture content between the soil of the crop-covered and cultivated plots. In illustration of this, we might refer to the differences for May 20, June 3, and August 12, recording the largest rainfalls. The heaviest fortnightly precipitation of the season is for the two weeks preceding the last mentioned date, viz., 4·17 inches, when the difference in favour of the 'cultivated' soil is only 5 tons per acre.

From the 1st July the system seeks to provide the orchard soil with a cover of vegetable growth, which serves (1) to utilize any excess of soil moisture, thus checking the development of the tree and promoting the ripening of its wood, (2) to furnish the roots of the trees with a protection against frost, (3) to enrich the soil in humus and nitrogen, and thus improve it mechanically and chemically, and (4) to assimilate and retain the nitrates formed during the summer months. It is with regard to the first of these only that we shall now present data.

Plot 'A.'—Commencing with July 15, it will be noticed that in the cultivated soil, as heretofore, there was always an excess of water over that present in the soil supporting a growing crop. In other words, there was invariably less soil moisture available for those trees where the clover was growing than for those in the bare and stirred soil. This is more readily seen from the subjoined table:—

	Rainfall.	Decrease in amount of Water, per acre, due to growth of Cover crop and capillary action.	
	Inches.	Tons.	Lbs.
July 15	1·26	85	1,557
" 29	1·37	121	5
August 12	4·17	5	717
" 26	·29	46	893
Sept. 10	·52	110	1,686
" 23	1·68	33	505
Oct. 7	1·93	54	1,644
" 21	·67	26	138

Any extended comment on these results is unnecessary, their character is sufficiently pronounced to tell their own story. The amounts of water which may be con-

sidered as utilized by a growth of clover during the middle and late summer months are very large. In some instances we find that as much as 50 per cent of the soil moisture can in this way be appropriated. Thus, on September 10, after a month in which only ·81 inches of rain fell, the orchard soil carrying a crop of clover contained per acre to a depth of 14 inches 103 tons of water, while the adjacent area that had been kept cultivated possessed to a similar depth 214 tons.

Plot 'B.' This portion of the orchard gave results pointing in the same direction as those of Plot 'A.' On 11 dates out of the 13 on which the collections were made there was an excess of moisture in the cultivated soil.

		Rainfall.	Excess, of Water, per acre, in cultivated soil.	
		Inches.	Tons.	Lbs.
May	6	1·33	8	568
"	20	2·74	....	....
June	3	2·13	14	92
"	17	1·31	24	1,945
July	2	1·73	57	586
"	15	1·26	69	905
"	29	1·37	120	169
August	12	4·17	51	1,715
"	26	·29	....	....
Sept.	10	·52	64	465
"	23	1·68	50	721
Oct.	7	1·93	133	601
"	21	·67	42	895

From May 6 to July 2, the differences are not so large as those for Plot 'A.' This was partly due, no doubt, to the soils not being identical in character and humus-content, but also in a great measure, we believe, to the less luxuriant growth on Plot 'B,' and to the fact that upon it grass had in a large measure supplanted the clover.

Then again, the cultivated portion of Plot 'A' had been cultivated during the previous season (1900), whereas that of Plot 'B' had been in crop. This would tend to give the former the larger amount of moisture. (See article on Conservation of Soil Moisture in report of this Division for 1900.)

We are not at present able to give any satisfactory explanation regarding one or two apparently abnormal results from this plot, as, for instance, on May 20 and August 26, when slightly more moisture was present in the soil under crop than in that under cultivation. These exceptional data are not, however, sufficiently numerous or marked to materially lessen the value of the experiment or cast doubt upon the correctness of the results in general.

This investigation has furnished corroborative evidence of an instructive and accurate character respecting the effectiveness of this system of cover crops and cultivation in the regulation of soil moisture. Much more, perhaps, could have been read into the results, but it was thought wiser to consider only their general trend, leaving until we make further research the discussion of points respecting which there is at present some obscurity.

The past season at Ottawa until the middle of August showed an ample and well distributed, though not excessive, rainfall. There was then a 'dry' month, followed by a fairly normal precipitation till the close of the experiment. It may be possible that the results would be different from those here recorded if obtained in a less favourable season. It will be desirable, therefore, to continue this investigation, extending its scope and making such changes in the plan of working as may be deemed from time to time advisable.

FERTILIZERS

MUCKS AND MUDS.

Owing to press of work in connection with special investigations, most of the samples of the naturally-occurring fertilizers received this year have been judged and

reported upon from a preliminary examination. Since the results so obtained are only partial in their character, they will not be inserted here, but we may include the data of a few samples of which a more complete examination has been made.

Swamp Muck.

Ontario, Algoma, Oxdrift P.O., forwarded by James Latimer :—

Analysis of (air-dried) Muck.

Moisture	8·01
Organic and volatile matter	27·62
Mineral matter, insoluble in acid	49·00
Mineral matter, soluble in acid	15·37
	100·00
Nitrogen, in organic matter	1·236

This muck, though somewhat below average quality, possesses a considerable fertilizing value and would prove useful for all classes of soils deficient in organic matter (humus) and nitrogen. If first composted with barn-yard manure, it should make a fertilizer of some worth for garden stuff, or for top dressing grass.

Prince Edward Island, Charlottetown.—Two samples of muck or peaty soils, forwarded by Mr. Franklyn Bovyer, with a request for information as to their relative value considered as soils, may be here reported upon.

Analyses of (air-dried) Mucks.

	No. 1.	No. 2.
Moisture	5·02	8·39
Organic and volatile matter	46·83	74·65
Mineral matter, clay, sand, &c.	48·15	16·96
	100·00	100·00
Nitrogen, in organic matter	1·43	2·65

As a soil, we should expect No. 1 to be the better, since it contains a more suitable proportion of clay and sand for most crops than No. 2. It would probably more readily furnish available mineral constituents to the growing plants and, certainly, contains a sufficiency of nitrogen.

Considered from the standpoint of their nitrogen and humus, No. 2 is the better. This makes it more valuable for composting purposes.

Both samples are distinctly sour, and would in consequence, for the majority of crops, be improved by lime or wood ashes.

'Mud' from the Flats at Yarmouth, N.S.

Nova Scotia.—In the harbour of Yarmouth there is a vast deposit, concerning the nature of which and its fertilizing value information has been asked by several farmers in the neighbourhood of the town. Thus in writing under date of February 20, 1901, Mr. W. T. Sterritt, of Yarmouth, N.S., says : 'This accompanies a sample of 'flats mud,' of which our harbour is full. We request the favour of an analysis, and if it possesses any merit as a fertilizer, we should be glad to know it, for it can be easily obtained here in practically unlimited quantities. It has not, apparently, been used as a fertilizer, but there are many farmers here who are anxious to learn if it is worth applying.'

It is of a slatey-gray colour, very similar to clay in consistency when wet. On exposure to the air it dries into somewhat hard masses.

Analysis of (air-dried) Mud.

Moisture	2·06
Organic and volatile matter	4·86
Clay and sand (insoluble in acid)	83·44
Oxide of iron and alumina	5·92
Lime	1·02
Magnesia	·70
Potash	·01
Phosphoric acid	·19
Common salt	1·80
	100·00
Nitrogen, in organic matter	·215

The percentages of the essential elements of plant food—nitrogen, phosphoric acid, and potash—are so small that we should not feel justified in advising the use of this deposit as a fertilizer. It is quite possible that it might be applied beneficially to certain soils, but the advantage would be from its mechanical, rather than its manurial, effect.

The amounts of nitrogen and phosphoric acid are very similar to those found in fairly good soils, but the percentage of potash is extremely small. There is a notable, though not large, percentage of lime, which no doubt would give the deposit a value for soils deficient in this element. Owing to the, comparatively speaking, large amount of salt and the fact that the mud dried into hard lumps, we think its trial should be made with care and at first only on a limited scale.

MARL AND LIMESTONE.

There are many soils in Canada capable of improvement by the judicious use of lime. As this fact becomes better recognized we not only receive inquiries respecting the application of this amendment, but also many specimens of marl and limestone for report as to their lime-content. In districts where lime is scarce, or expensive by reason of long freightage, and deposits of marl (carbonate of lime) occur, this latter material may be advantageously employed as a source of lime, either as a direct application to the soil or after burning. Again, it frequently happens that neither lime nor marl is easily procurable, and then information is sought as to the character of the rock in the neighbourhood, with a view to the possible production of lime by burning.

The majority of the samples so received have been reported upon simply from a preliminary examination—this being considered to afford sufficient information for the purpose. A few of them, however, have, for special reasons, received a more or less complete analysis, and the results so obtained are here inserted.

Marl.

British Columbia.—A sample forwarded from Spallumcheen Valley, B.C., by Mr. Donald Graham, of Armstrong, furnished the following data:—

	p. c.
Insoluble rock matter	23·11
Carbonate of lime	52·68
Organic matter, oxide of iron, &c. (undetermined)	24·21
	100·00

This would yield, on burning, practically 30 per cent of lime, and consequently, if occurring in any quantity, would be valuable in those districts in which the soil needs this element of plant food.

It is found underlying muck, but the extent of the deposits in this district is not known to the writer.

Nova Scotia.—From Lower Settlement, South River, sent by Mr. James Dunn.

	p. c.
Insoluble rock matter	18·68
Carbonate of lime	69·46
Organic matter, oxide of iron, &c. (undetermined)	11·86
	100·00

This is a marl of very fair quality and would prove a valuable source of lime for all soils requiring this element. On burning, it would yield about 39 per cent of lime.

Limestone.

Quebec.—From Stornaway, Compton county, sent by Mr. E. M. Campbell, who writes: 'The soils of the farms in this vicinity would be greatly benefited by an application of lime. We shall be glad to learn if lime for such a purpose could be obtained by burning the rock, a sample of which I send you herewith.'

	p. c.
Insoluble rock matter	86.03
Carbonate of lime	3·19
Oxide of iron and alumina	9·78
Undetermined	1·00
	100·00

It is quite evident from these figures that this rock is not limestone, and would be valueless for the purpose of making lime.

From Labelle county, sent by Hon. Wm. Owens, Montebello. There are many stiff clay loams in this locality, which, it is presumed, would be improved, chemically and mechanically, by an application of lime. The analysis of two specimens of 'limestone rock' occurring in the district furnished the following results:—

	Light Specimen. Per cent.	Dark Specimen. Per cent.
Insoluble rock matter	29·70	36·20
Carbonate of lime	60·75	54·55
Oxide of iron and alumina	5·40	5·70
Undetermined	4·15	3·55
	100·00	100·00

There is no great difference in value between the samples. The 'light' limestone would yield, completely burned, 34 per cent lime; the 'dark' limestone, 30 per cent lime. Though the resulting lime would be too poor for building purposes, it might be used to advantage agriculturally.

THOMAS' PHOSPHATE FLOUR (BASIC SLAG).

Under several names, Gilchrist Thomas Slag, Basic Slag, Thomas' Phosphate Flour, &c., a by-product of the Bessemer steel process, finds its way upon the market.

Its fertilizing value may be said to depend upon two factors : the percentage of phosphoric acid present, and the degree of fineness to which the slag has been ground. Although only introduced into Canada some three years ago, it is fast growing in favour, being found a useful source of phosphoric acid, more especially for sour soils, those rich in humus, and those deficient in lime.*

Basic slags, as might be expected, will vary in composition, but usually they contain between 15 per cent and 20 per cent of phosphoric acid, of which we have found about two-thirds is soluble in a 1 per cent solution of citric acid, and hence may be considered as more or less 'immediately available.' There is also present a certain amount of free lime, generally about 15 per cent, and it is this fact that gives the slag an additional value for soils of the character we have mentioned. With respect to the *fineness of grinding* already referred to, it has been ascertained that the solubility of the phosphoric acid, in other words, the activity of the fertilizer, is in proportion to the degree of fineness—the coarser the slag the slower does it set free its phosphoric acid for crop use.

To obtain data upon the degree of availability of its phosphoric acid, certain laboratory experiments were made upon a sample of 'Thomas' Phosphate Flour,' forwarded by a correspondent in Nova Scotia, in which province, as well as in New Brunswick, we learn this fertilizer has a large sale. It was in the form of a fine, almost impalpable powder.

The total phosphoric acid present was found to be 18·23 per cent.

Citric Acid, 1 per cent.—One gram of the fertilizer was shaken up with 100 c.c. of 1 per cent citric acid solution (a solvent presumed to be approximately equal to the exudations of roots in strength or power of rendering soluble mineral plant food) for two hours at ordinary temperatures and filtered. Analysis showed that 10·33 per cent phosphoric acid had entered into solution. In the next experiment 1 gram of the fertilizer was shaken up with 200 c.c. of the 1 per cent citric acid solution, time and temperature being the same as in the preceding trial. Phosphoric acid to the extent of 11·55 per cent had been dissolved.

Further investigation will be made to ascertain, if possible, the limit of solubility or availability, but these data are in themselves sufficient to indicate that a very large proportion of the phosphoric acid *may* be rendered assimilable during the first season of application. Further, it is evident that this fertilizer is not, as thought by some, to be considered in the same category, as regards availability, with 'phosphate rock,' 'floats,' &c., forms of phosphoric acid which can scarcely be used directly owing to their very slow solution in the soil.

In England and Germany, countries now using large quantities of this fertilizer (Basic slag), especially as a top dressing for grass lands, the relative value of a sample is determined by the amount of phosphoric acid soluble in a 2 per cent citric acid solution (Wagner's method). By this stronger solvent we obtained from the sample under consideration 12·77 per cent phosphoric acid.

WOOD-ASHES.

In the course of the examination of many soils from British Columbia, it has been made evident in a number of instances that it would be advisable to apply lime, either to supply a deficiency in this element of food, to serve as a correction for sourness or to aid in the conversion of certain injurious iron compounds found in badly drained lands. To this end we have advised the application of wood-ashes, which would not only furnish lime, but also notable amounts of those important constituents of plant food—potash and phosphoric acid—but to this suggestion we almost invariably receive the reply that such are not obtainable. The common and, indeed, almost universal impression among farmers of that province is that the soft woods, Douglas fir, cedar, &c., do not contain any mineral matter and produce no ash when burnt. There is no

*For a fuller account of this fertilizer, see report of this Division for 1898, p. 160.

doubt but that the percentage of ash in these woods is small, much less than in hard woods, but that there is not any ash is an error. The very 'light' character of the soft wood ashes, rendering them easy of dissipation by the wind, has, we think, materially assisted in this belief. It is our intention, therefore, when an opportunity permits, to ascertain the amount and composition of the ash in the various British Columbia woods grown on soils of various characters, but in the meantime it will be of interest to furnish the data from a sample of Douglas fir ashes forwarded from Kamloops, B.C., recently analysed in our laboratories. The correspondent sending the ashes says: 'The Douglas fir wood ashes I send are just as taken from the ash heap at the power house here. Kindly let me know if they contain any considerable amount of potash, and if they would be valuable as a fertilizer for an orchard soil.'

Our analysis furnished the following data:—

	p. c.
Moisture	·19
Organic and volatile matter	·90
Insoluble residue (clay, sand, &c.)	40·68
Oxide of iron and alumina	13·95
Lime	27·13
Potash	3·12
Phosphoric acid	1·84

Microscopic examination of the 'insoluble residue' revealed the presence of a considerable amount of quartz sand with a certain small proportion of clay. We may fairly presume, therefore, that the sample is not representative of the pure ash of the Douglas fir. Considered as a commercial sample of wood ashes, it may be noted that they are not of equal quality with hardwood ashes purchasable in eastern Canada, which contain, on an average, 5½ per cent of potash. They nevertheless possess a sufficiency of this element to give them a distinct value as a potassic fertilizer. And further, their lime content points to their usefulness for such soils as we have been considering. We would strongly advise farmers, and especially fruit growers, to procure when possible such ashes, feeling assured that it is only from soils comparatively rich in available mineral constituents that vigorous, healthy growth can be obtained.

TANNERY WASTE.

This material consists largely of 'fleshings' or scrapings from the hides after their maceration—the first step in the cleansing process of the hide at the tannery. When this waste is fairly free from hair, leather scraps and other similar substances that resist decay (as is usually the case), we may suppose it to furnish nitrogen that will, more or less readily become converted by nitrification (as for instance, by fermentation in the compost heap, or more slowly in the soil) into forms assimilable by plants. It is consequently to be considered a valuable nitrogenous fertilizer.

A correspondent in Oakville, Ont., forwarded a month ago a sample for examination. It was a reddish mass of the consistency of cheese, showing white spots or particles throughout and possessed of a most offensive smell. On analysis, we obtained the following data:—

Analysis of Tannery Waste.

Water	45·91
Organic matter	53·42
Ash or mineral matter	·67
	100·00
Nitrogen, in organic matter	3·23

Potash and phosphoric acid being practically absent, the fertilizing value of this substance depends on its percentage of nitrogen and the readiness with which this element might be liberated for plant use.

From what has already been said it might be inferred that the relative value or usefulness of nitrogen in various fertilizers differs greatly, according to its availability. Thus, the nitrogen of nitrate of soda is immediately usable by crops, and capable of giving a large increase in yield at once; it is consequently worth more, pound for pound, than the nitrogen in bone meal, which only becomes slowly available by the decay of the bone in the soil. The relative values or availability of the nitrogen in certain of the more important agricultural forms, as ascertained by vegetation tests, has been given, approximately, as follows:—

Nitrate of soda	100
Dried blood	70
Ground fish and flesh meal	65
Bone meal	60
Leather, wool, hair, horn and hoof	5 to 30

Presuming that all the nitrogen present exists as flesh, then we may assign to it a value equal to half of the value of nitrogen in nitrate of soda, but if there is any admixture of hair, leather, &c., then it might not be worth more than one-fourth that amount.

Leather waste and hair.—These, agriculturally speaking, are of very little value, owing to their power of resisting decay. Thus, though they may contain large amounts of nitrogen, this element is 'locked up' so securely as to be for a very long time quite useless to plants. Some authorities state that decomposition may be started and the nitrogen set free by composting the leather waste with actively fermenting dung, with urine or with strong alkalies, such as potash, but considering the refractory character of this material, the writer is of the opinion that nitrogen can be obtained cheaper, as from the clover crop, for instance. However, if it is wished to make a trial, a plan suggested would be to place the waste in alternate layers with good unleached wood ashes in a large vat, keeping the mass thoroughly moistened. At the expiration of several months the waste will be disintegrated and to a certain extent decomposed. A modification of this plan would be to pour a hot solution of lye over the waste and allow to remain for some time. Fertilizer manufacturers adopt the method of roasting the leather waste and heating with sulphuric acid (oil of vitriol) subsequently neutralizing the residue. This process is the most effective towards making the nitrogen assimilable, but unfortunately it is not practicable upon the farm, special apparatus and experience being required.

SEA-WEED.

Large quantities of sea-weed may be collected on both the eastern and western coasts of Canada, and hence farmers are constantly inquiring as to its fertilizing value and the best methods for its use.

In the report of this Division for 1894, we published the analysis of rock-weed (*Fucus furcatus*), obtained in January, at Smith's Cove, N.S. The data showed that it was to be considered as a valuable manure, on account of the potash and nitrogen it contained.

Composition of Rock-weed.

	p. c.
Water	63·49
Organic matter	27·93
Ash and mineral matter	8·58
	100·00

	Per cent.	Pounds per ton.
Nitrogen	·468	9·36
Potash	2·025	40·50
Phosphoric acid	·108	2·18

In September of the present year a sample of another variety of rock-weed (*Fucus vesciculosus*) was forwarded from St. Andrews, N.B. It was quite fresh when received, and was immediately analysed.

	p. c.
Water	79·23
Organic matter	15·23
Ash or mineral matter	5·54
	100·00

	Per cent.	Pounds per ton.
Nitrogen	·172	3·44
Potash	·76	15·20
Phosphoric acid	·04	·80

The fact that the sample analysed in 1894 contained less water (63·49 per cent) than the one examined this year will account, in part, for the present percentage of the fertilizing constituents being lower. It does not, however, entirely explain the differences that are to be noted, and we are unable to say whether such are in part due to inherent qualities of the two varieties or to the time of year (and consequently of growth) at which they were collected. Recent investigations conducted at the Rhode Island Experiment Station laboratories go to show that sea-weed gathered in the winter season are richer in fertilizing elements than those gathered in the summer.

The value of this essentially potash fertilizer is enhanced by the readiness with which this material decomposes in the soil, liberating the same season much of its plant food in assimilable forms. It answers best on warm, moist, porous soils, and may be lightly ploughed or harrowed under to the extent of 20 to 30 tons per acre. If it is inconvenient to apply the sea-weed at once to the soil it may be composted, care being taken that the potash is not lost by leaching rains.

Eel Grass (*Zostera marina*).

This marine plant grows freely and in large quantities in the shallow waters along the north shores of Nova Scotia and New Brunswick, and in the estuaries and bays of Prince Edward Island. It is generally considered to have little or no fertilizing value, and this opinion no doubt results from the fact that it is extremely difficult to rot it, either in the soil or in the compost heap. Nevertheless it contains notable amounts of plant food, as will be apparent from the subjoined analysis. Its chief uses at present are for mulching and as a material for banking up houses, barns, &c., in the autumn to keep out the frost.

In the year 1891, a sample of eel grass that had been dried at a gentle heat was forwarded from Haliburton Bridge, N.S., to the laboratories, and yielded the following data:—

	p. c.
Nitrogen, in organic matter	1·24
Ash or mineral matter	21·90
Phosphoric acid (in ash, 1·80 per cent)	·41
Potash (in ash, 13·28 per cent)	2·90

In December, 1900, we received from Mr. D. J. Stewart, Aitkens Ferry, P.E.I., two samples, of which he writes as follows :—' No. 1 is the fresh green Eel grass, in

long pieces. No. 2 is in short, broken up pieces which come ashore in large quantities in the autumn. We should like to know their relative value as regards plant food. Most farmers in this section consider the short, brown material of little or no value, and it is possible that it has lost some of its potash by being so long in the salt water. If of equal value, weight for weight, it would be more economical to haul the short stuff. Further, the latter mixes better with stable manure than the fresh green Eel grass. After cleaning out the cow stable we place a layer of the short grass in the gutter as an absorbent and we have had good results by having as much as half the bulk of manure of Eel grass. However, it is as a summer mulch for strawberries that I have used the largest quantity of this short material, and find it for this purpose much better than cut straw, which, as you know, gets wet and mildews and is apt to induce decay in the berries. This short sea-weed never mildews and the berries resting upon it remain sound.'

Our analyses of these two samples are as follows:—

	Fresh material, in long pieces.	Short, brown, old material.
Water	74·05	84·81
Ash or mineral matter	7·16	4·81
Ash, insoluble in acid	·91	1·43
Phosphoric acid	·11	·05
Potash	·87	·05
Nitrogen, in organic matter	·42	·17

It is evident from these data that, weight for weight, the fresh Eel grass contains much the larger percentage of plant food. The short, brown material has lost half of its phosphoric acid, about nine-tenths of its potash, and somewhat more than half its nitrogen. As to the relative availability of these constituents in the two samples, it is impossible to speak with certainty, but possibly the short, brown Eel grass may have the advantage in this respect.

There is no doubt that the application of Eel grass directly to the soil would be of little value, owing to its strong resistance to decay, but first air-dried and used as an absorbent material in the stable, or composted, we think its fertilizing constituents could in a large measure be made available.

FODDERS AND FEEDING STUFFS.

ROOTS.

In the report for 1900 we furnished information respecting the comparative feeding value of certain roots, as ascertained by chemical analysis on the crop of that year. To learn how far the character of the season or other possible factors might affect the composition of these roots, as well as to obtain data that could be used in compounding rations for steers under experiment during the coming winter, we have submitted to analysis specimens from the crop of 1901 grown on the Central Experimental Farm.

Time did not permit us to make complete analyses. We, therefore, determined the percentage of dry matter and the percentage of sugar (in juice), these being the two most important data from the feeding standpoint. The amount of true protein in roots is very small, and fat exists practically in traces, so that in the results here given we have all the necessary figures upon which to base a judgment as to the nutritive value of the roots.

ANALYSIS of Roots, Central Experimental Farm, Ottawa, 1901.

Number.	Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of one Root.	
					Lbs.	Oz.
1	Gate Post Mangel	90·59	9·41	4·15	2	9
2	Golden Fleshed Tankard Mangel	90·37	9·63	5·02	2	7
3	Giant Yellow Globe Mangel	90·90	9·10	4·80	3	3
4	Short White Improved Carrot	89·78	10·22	4·63	1	9
5	Intermediate Short White Carrot	90·51	9·49	4·40	2	3
6	Danish Improved Sugar Beet, ordinary culture	81·47	18·53	11·87	2	1
7	" " " (another sample)	83·16	16·84	11·49	3	6
8	" " special culture	80·61	19·39	11·28	1	11
9	" " " (another sample)	81·50	18·50	12·60	1	7
10	Half Sugar Rosy Mangel (Vilmorin)	....	....	7·38	2	4
11	Half Sugar White Mangel (Vilmorin)	....	....	6·47	2	5
12	Vilmorin's Improved Sugar Beet	....	....	14·08	1	10
13	Danish Red Top Sugar Beet	....	....	10·54	1	12
14	Danish Improved "	....	....	15·47	1	9
15	Red Top Sugar "	....	....	8·89	1	15
16	Royal Giant "	....	....	7·88	1	15
17	Klein Wanzleben "	....	....	14·91	1	6
18	Improved Imperial "	....	....	9·80	2	0

MANGELS.

It will be evident on comparing the present results with those recorded last year that the composition of any particular variety is by no means constant. The factors that control this susceptibility to change are possibly three: the seed, the soil, and the season. The size of the root, however, has also been shown to be a matter of importance—the larger roots being usually found to contain somewhat the less dry matter, and, therefore, compared weight for weight with smaller roots of the same variety, to be of less feeding value. As the roots this year selected for analysis were slightly smaller than those of last season, this cause cannot be advanced to explain the lower percentages of dry matter which is observable in many of the examples.

The results of the three varieties of mangels—Gate Post, Golden Fleshed Tankard, and Giant Yellow Globe—gave an average last year of 9·86 per cent dry matter, and 4·52 per cent of sugar in juice; this season we obtained 9·04 per cent and 4·65 per cent respectively, for these constituents. Taking the average data of a class of roots, therefore, the variations are not large, though there may be considerable differences between the roots of any one variety, from year to year.

SUGAR BEETS.

The 'Danish Improved' was the sugar beet grown both seasons under 'ordinary' and 'special' culture in the field to ascertain the effect of earthing upon the relative feeding value. Our results for the dry matter and sugar are:—

—	1900.		1901.	
	Dry Matter.	Sugar in Juice.	Dry Matter.	Sugar in Juice.
Ordinary culture	20·35	16·43	17·68	12·68
Special culture	21·49	16·98	18·54	12·94

With regard to this variety, we have observed that of all the sugar beets grown during the past two seasons on the Central Farm it showed the least tendency to grow above the surface of the soil, and consequently required least earthing up. Indeed, very little difference could be detected between the roots earthed up and those grown under ordinary field culture, and the analytical data confirm this observation. For this reason we are of the opinion that it would be a desirable variety to grow where the crop is intended for feeding purposes.

Sugar beets Nos. 12 to 18, inclusive, did not receive special culture, being simply grown in test plots to obtain the yields per acre. We notice that the Danish Improved stands highest in sugar content, corroborating the statement just made regarding this variety. The Klein Wanzleben and Vilmorin's Improved stand next in order of merit. No doubt, under special culture for factory purposes, the majority of these varieties would have shown a much higher percentage of sugar, but the present results are of interest in showing their relative merit in sugar production when treated as ordinary field roots.

Mangels with a high sugar percentage.

We would call special attention to the two mangels, Half Sugar Rosy and Half Sugar White (Nos. 10 and 11), from seed produced and kindly furnished by Messrs. Vilmorin, of Paris, France. The sugar content is remarkably high for mangels, clearly indicating their importance for feeding purposes. We have in them an excellent example of the scope and value of special breeding and selection with a definite end in view, the Messrs. Vilmorin having for some years been engaged in developing a mangel with a high sugar percentage.

Sugar content in lower and upper parts of roots.

To furnish experimental proof of the statement regarding mangels that has several times been made respecting sugar beets, viz., that the part of the root beneath the soil contains more sugar, and hence has a higher feeding value than the portion above ground, we made an analysis of six roots each of Gate Post and Giant Yellow Globe mangels, estimating the sugar in the upper and lower parts of the roots. The following statement gives our results:—

Variety of Mangel.	Percentage of Sugar.
Giant Yellow Globe Mangel—part below ground	5·08
" " part above ground	4·54
Gate Post Mangel—part below ground	4·75
" part above ground	4·12

A consideration of the fact that sugar is the chief constituent of value in roots might lead us to infer, in the light of this experiment, that a system of culture which tends to keep the roots fairly well earthed up is one that will result in the most nutritious crop. Further, those varieties which naturally tend to grow beneath the soil, providing they furnish an adequate yield per acre, will be the most profitable to grow.

ON THE CHANGES IN THE COMPOSITION OF ROOTS DURING STORAGE.

There is an impression among many stock feeders of experience that the feeding qualities of ordinary farm roots improve with storage. This opinion, however, is not generally held, and it was, therefore, to obtain further information regarding possible changes in the composition of roots during storage in a root cellar, that analyses were made from time to time (from October, 1900, to March, 1901) of several varieties from the crop of 1900. The roots examined included three varieties of mangels, two of carrots, and one each of turnips and sugar beets. About two bushels of each variety were selected—roots of typical size and shape only being taken—and placed in bags which were throughout the investigation kept buried in a large heap of roots in the cellar. By this means the conditions of storage obtained were similar in all respects to those ordinarily prevailing in good root cellars. On March 15, the last date of analysis, the roots remaining were all sound and in good condition. The sample for analysis in each instance consisted of six roots.

Before discussing the results of the present investigation, however, it may be profitable to consider certain facts regarding this problem that have been recently brought to light by the researches of other investigators. In 1898, Wood showed the nitrates present in the juice of the mangels, as pulled, decreased in amount to the extent, approximately, of one-half by January 15. 'These nitrates, he states, 'are liable to cause derangement in digestion; by January these nitrates have been changed into amides which have some feeding value and are quite harmless.'* The probability is that under systems of manuring as practised in Canada, nitrate of soda or sulphate of ammonia not being extensively used, the proportion of nitrogen in the freshly pulled root present in the form of nitrates is not so large as that in roots from highly fertilized fields, as in England. Nevertheless, this discovery is an important one as showing the trend of change in certain of the nitrogenous compounds of roots.

In an exceedingly able and exhaustive paper on this subject, Dr. A. H. J. Miller,† after quoting results obtained by the late Dr. Voelcker, to the effect that stored roots undergo considerable change, chiefly by loss of sugar and allied bodies, and possibly also of nitrogenous compounds, due to a process of slow combustion, gives in detail the data of an interesting series of experiments conducted by himself on mangels grown with and without nitrate of soda at Rothamsted. After tabulating the results from mangels receiving no nitrate, Dr. Miller concludes: 'No essential change (except in total weight, evidently due to loss of water) took place up to the end of March. During the next three months (*i.e.*, till the end of June), however, there was a considerable loss of dry matter, much of which was due to destruction of sugar, whilst about half the cane sugar was inverted.' By June 20, about 14 per cent of the total sugar originally present had disappeared, but the loss in non-nitrogenous matter other than sugar exceeded this amount. The examination of mangels that in addition to other manure had received 550 pounds of nitrate of soda per acre showed 'a regular decrease both of dry matter and of sugar. Even by the end of March the loss of sugar was considerable, and a good deal inverted.' After discussing the probable loss in sugar per acre of roots by storage until the end of June, he says: 'Taking into account the variety of conditions which presumably affect the changes undergone by stored roots, any conclusions drawn from the results can only be given with some reserve. It seems, however, very probable that a considerable loss of the most important constituent, sugar, and of other constituents, does frequently take place. That nitrate of soda increased the loss of sugar, if not of other constituents, seems to be highly probable, since the two lots of roots were kept together

---

*Changes in Mangels during storage, T. B. Wood, Journal R.A.S.E., 3rd series, Vol. IX., part III.

†Experiments at Rothamsted on the changes in the composition of mangels during storage, A. H. Miller, Journal R.A.S.E., 3rd series, Vol. XI., part I.

under exactly the same conditions.' He further adds: 'Increased digestibility after a lengthened period is conceivable, and might be due to a partial breaking down of the crude fibre,' but 'in view of, however, the small amount of crude fibre in roots, a change of this kind would seem to be of doubtful value, and any gain in digestibility, if it takes place, may be a good deal more than counterbalanced by the losses to which we have called attention.'

The practical suggestions for the Canadian farmer that seemed to be called forth by this important work are that the temperature of the root cellar should be kept as cold as possible—but not reaching the freezing point—and that the cellar should have good ventilation. Under such conditions the process of slow combustion that causes the loss of sugar will be retarded.

Our own investigation had for its chief object the tracing of the albuminoids during storage, it being thought that as spring approached these would be converted into amides or other nitrogenous compounds of less feeding value.

Dry Matter in Roots during Storage.—In table I. the percentages of water and dry matter for the several roots are given as determined when the roots were freshly pulled (October), in January and in March of the following year. The most obvious and remarkable feature of these data is their uniformity for each variety of root, showing, as they do, that throughout the period of storage the ratio of dry matter to water-content remained practically the same. Such differences as do occur are not greater than would have been obtained from the examination of individual roots. There had evidently been no 'drying out' of the roots.

While it is impossible to state absolutely from these results that until March 15 there had been no loss in total weight, we may fairly infer that such loss, if any, can not have been large. It is satisfactory, therefore, to note that the conditions of storage were in such a large measure conducive to the preservation of the roots. If we were to estimate feeding value simply by percentage of dry matter, then, weight for weight, the roots in March are as nutritious as they were in the October previous.

Nitrogen in Dry Matter.—Determinations of the total, albuminoid and non-albuminoid nitrogen were made on the roots in October, January and March, and the results calculated upon the dry matter. These are presented in table II.

Total Nitrogen.—In five of the seven instances cited, the nitrogen is slightly higher in March than in October. This is evidently due to the destruction by slow combustion of a small amount of the non-nitrogenous organic matter, which would necessarily leave the dry matter rather richer in nitrogen. This, as we shall see later on from our results, does not mean necessarily that the dry matter is more nutritious in the roots stored until March. With two of the varieties there had been a small loss in total nitrogen. This may have resulted from differences in the individual roots examined, or to a direct loss of nitrogen by fermentative changes.

TABLE I.—COMPOSITION of Roots During Storage—1900-1901.

Date of Examination.	Gate Post Mangel		Giant Yellow Globe Mangel.		Golden Tankard Mangel.		Improved Short White Carrot.		Guérande or Ox-Heart Carrot.		Champion Purple Top Turnip.		Danish Improved Sugar Beet.	
	Water.	Dry Matter.	Water.	Dry Matter.	Water	Dry Matter.	Water.	Dry Matter.	Water.	Dry Matter.	Water.	Dry Matter.	Water.	Dry Matter.
October 27	88·86	11·14	91·82	8·18	89·75	10·25	91·54	8·46	88·36	11·64	89·23	10·77	78·51	21·49
January 15	88·87	11·13	92·34	7·66	91·15	8·85	89·49	10·51	89·55	10·45	89·85	10·15	79·58	20·42
March 15	89·92	10·08	90·54	9·46	90·94	9·06	90·27	9·73	89·35	10·65	88·91	11·09	78·98	21·02

TABLE II.—NITROGEN in Dry Matter in Roots, 1900-1901.

Date of Examination.	Gate Post Mangel.			Giant Yellow Globe Mangel.			Golden Tankard Mangel.			Improved Short White Carrot.			Guérande or Ox-Heart Carrot.			Champion Purple Top Turnip.			Danish Improved Sugar Beet.		
	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.	Total Nitrogen.	Albuminoid Nitrogen.	Non-Albuminoid Nitrogen.
October 27	1·17	·75	·42	2·43	1·19	1·24	1·28	·84	·44	1·58	1·02	·56	1·53	·91	·62	1·26	·91	·35	1·03	·52	·51
January 15	1·03	·59	·44	2·16	·85	1·31	1·55	·79	·76	1·43	·74	·69	1·62	·75	·87	1·63	·86	77	1·01	·44	·57
March 15	1·39	·75	·64	1·72	·64	1·08	1·95	·82	1·13	1·54	·79	·75	1·76	·84	·92	1·76	·96	·80	1·14	·54	·60

The Albuminoid and Non-albuminoid Nitrogen.—The percentage of albuminoid nitrogen (which, as we have said, has the greater feeding value) appears to remain fairly constant in the dry matter throughout the period of storage, though in the case of two of the roots, Giant Yellow Globe mangel, and Improved Short White carrot, there had been a notable decrease, due probably, in part at least, to the breaking down of the albuminoids. Since, as we have seen, the percentage of total nitrogen (calculated on the dry matter) in the majority of the examples increased somewhat during storage, it necessarily follows that the percentage of non-albuminoid nitrogen has slightly increased. This is the case in each class of roots, as will be observed by reference to table II. It is perhaps the most noticeable fact brought out by this investigation.

TABLE III.—Ratio of Albuminoid to Non-albuminoid Nitrogen in Roots.

Date of Examination.	Gate Post Mangel.	Giant Yellow Globe Mangel.	Golden Tankard Mangel.	Improved Short White Carrot.	Guérande or Ox Heart Carrot.	Champion Purple Top Turnip.	Danish Improved Sugar Beet.
October 27	1:0·56	1:1·04	1:0·52	1:0·55	1:0·68	1:0·38	1:0·98
January 15....	1:0·74	1:1·54	1:0·96	1:0·93	1:1·16	1:0·89	1:1·27
March 15..........	1:0·85	1:1·68	1:1·38	1:0·95	1:1·09	1:0·83	1:1·11

The non-albuminoid nitrogen includes that present in amides and other compounds of inferior feeding value. We may, therefore, assume that provided the percentage of total nitrogen in the dry matter does not decrease, then the feeding properties of that dry matter, as far as nitrogenous compounds are concerned, will depend upon the relative proportion of the albuminoid to the non-albuminoid nitrogen. In table III. we have given this ratio (calculated from the data of table II.), which, it will be observed, in all the roots save the sugar beets increases markedly during the storage period.

From the foregoing statements and data we may infer (1) that nitrates, resulting more particularly from high manuring with soluble nitrogenous fertilizers, and which are more or less injurious to the animal, tend to disappear on storage of the roots; (2) that there is a tendency to fermentative changes during storage that lead chiefly to the destruction of the sugar—the most important nutrient of roots. This deterioration may no doubt in a large measure be controlled by low temperature and good ventilation ; under such conditions, we imagine the loss does not assume in our winter climate any grave proportions. It would no doubt be found to increase markedly after March. Further, (3), that the non-albuminoid nitrogenous componds increase, as a rule, with storage and especially so during the spring months.

It is possible, as pointed out by Miller, that the digestibility of the roots may slightly increase with storage—but this at best can only be a small gain—and, therefore, apart from the question of nitrates, there is no considerable improvement in the quality of roots by storage, as thought by some, but rather a tendency to loss, as evidenced by destruction of the sugar and the formation of non-albuminoid compounds.

Sugar Beets.

The sugar beets examined and here reported upon comprise samples from Strathcona, N.W.T., Winnipeg, Man., and Prince Edward Island.

North-west Territories.—Strathcona, Alta.

These samples were forwarded by Mr. Nelson D. Mills, Strathcona, who in sending the particulars of growth (October 1) writes: 'These beets were sown very late, and came through two hailstorms of unusual severity. In addition to this there have been severe white frosts during the last two weeks, so that if they show a proper percentage of sugar, then no weather that Alberta has in store can interfere with beet raising. I may add that none of the beets had special attention as to tillage, such as deep ploughing and cultivating to kill weeds, &c.'

The particulars of growth as furnished by Mr. Mills are given in table I.; the analytical data in table II.

Table I.—Sugar Beets—Strathcona, N.W.T., 1901.

Number.	Name.	Address.	Variety of Beets.	Dates.		Distance between		
				Sowing.	Pulling.	Rows.	Plants in Rows.	
						Inch.	Inch.	
1	William Place.	S.W. ¼ Sec. 11, Tp. 52, R. 24, 4 miles from Strathcona........	Klein Wanzleben	June 15.	Sept. 30.	24	8	Black loam, clay subsoil.
2	Thos. Rooney.	2 miles south of Strathcona.......	" "	May 22.	Oct. 1..	24	6	Black loam, unmanured.
3	James Pithie..	Salisbury, Alta.....	" "	May 29.	Oct. 2..	30	10	Sandy loam, unmanured.

Table II.—Analysis of Sugar Beets from Strathcona, N.W.T., 1901.

Number.	Variety.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root.	
					Lbs.	Oz.
1	Klein Wanzleben..............................	15·01	17·95	84·73	1	1
2	" "	12·84	16·20	79·26	1	2
3	" "	14·02	17·20	81·51		13

Both as regards sugar-content and degree of purity, our data are indicative of excellent quality, and these beets would be considered as quite satisfactory for sugar extraction. In our report for 1900 we gave the analytical data from two samples of sugar beets grown in the Lethbridge district. These also indicated that beets with good sugar-content could be grown in Alberta, and it would, therefore, seem advisable, if sugar manufacture is seriously contemplated, to make a more complete test, growing the beets from the best seed, on larger areas and with strict attention to proper culture. The number of samples hitherto examined is too small for safe deductions as to the general suitability of Alberta for beet sugar production, but certainly the results so far obtained are of a promising character.

TABLE III.—Sugar Beets, Manitoba, 1901.

No. on bag.	Name of Grower.	Address.	Variety of Beet.	Dates.			Distance Between.		Remarks.
				Sowing.	Thinning.	Pulling.	Rows.	Plants in Rows.	
							Inches.	Inches.	
1	D. McKee	Winnipeg	Vilmorin's Impd	June 1	July 4	Oct. 7	....	....	Heavy black soil with alkali.
2	"	"	Klein Wanzleben, Impd	June 1	July 4	Oct. 7	....	....	" "
3	D. de Graaf	Louise Bridge	Klein Wanzleben	June 8	July 9	Oct. 8	16	8	Heavy black soil.
4	"	"	Vilmorin's Impd	June 8	July 9	Oct. 8	16	8	
5	John P. Haarsma	"	Vilmorin's Impd	June 10	July 8	Oct. 10	....	....	Black soil with a little sand, on
6	"	"	Klein Wanzleben, Impd	June 10	July 8	Oct. 10	....	....	river bank.
7	R. de Vries	"	Klein Wanzleben, Impd	June 1	July 2	Oct. 9	16	8	Heavy black soil.
8	"	"	Vilmorin's Impd	June 1	July 2	Oct. 9	16	8	
9	Hugh McKay	Fernton	Klein Wanzleben, Impd	June 13	July 4	Oct. 8	16	8	Black soil with a little sand, on
10	"	"	New Danish, Impd	June 13	July 4	Oct. 8	16	8	river bank.
11	A. Hutchings	Winnipeg	New Danish, Impd	June 16	July 2	Oct. 10	16	8	Light sandy soil, on river bank.
12	"	"	Klein Wanzleben, Impd	June 17	July 2	Oct. 10	16	8	" " "
13	J. C. Sproule	Kildonan	Klein Wanzleben, Impd	June 1	July 3	Oct. 1	24	12	Black soil, on river bank.
14	"	"	Vilmorin's Impd	June 1	July 3	Oct. 1	24	12	" "
15	J. B. Gowanlock	Neepawa	....	May 21	....	Sept. 26	....	....	Heavy sandy loam.

Manitoba.—At the request of the Department of Agriculture for the province, a further examination of sugar beets grown in the Red River valley in the vicinity of Winnipeg, has been made. The beets were received in excellent condition. Mr. Hugh McKellar, Chief Clerk, Department of Agriculture, Winnipeg, in furnishing the cultural data says: 'In a general way, the season was not considered favourable, there being too much rain.' In the foregoing tabular statement are given the varieties of seed used, the names of the growers, and other information respecting the beets, as furnished by Mr. McKellar.

The data for sugar-content and purity indicate, we regret to say, in by far the larger number of instances, beets too poor for profitable manufacture.

The appearance of the beets in several of the samples showed that the roots had not been kept earthed up. This fact, no doubt, accounts in part for the low results, and a further cause may be found in the unfavourable weather of the past year.

TABLE IV.—Analysis of Sugar Beets from Manitoba, 1901.

No.	Variety.	Percentage of Sugar in Juice	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root. Lbs.	Oz.
1	Vilmorin's Improved	10·03	15·27	65·68	1	12
2	Klein Wanzleben	9·52	14·64	65·02	1	8
3	"	10·70	15·01	71·28	1	9
4	Vilmorin's Improved	9·67	14·24	67·90	2	1
5	"	11·29	15·51	72·79	1	13
6	Klein Wanzleben Improved	10·88	15·91	68·38	1	12
7	" "	9·83	15·34	64·08	1	10
8	Vilmorin's Improved	7·85	12·50	62·80	1	15
9	Klein Wanzleben Improved	13·08	16·59	78·84	1	5
10	New Danish Improved	11·15	14·88	74·93	1	6
11	"	10·29	14·46	76·00	1	3
12	Klein Wanzleben Improved	8·65	12·26	70·55	1	2
13	" "	9·76	14·56	67·03	2	0
14	Vilmorin's Improved	7·53	11·16	67·47	1	10
15	...	2·36	6·19	38·12	2	3

Though the results, both this year and last, are far from encouraging and certainly give but little promise of successful beet culture in the Red River valley, it is possible that the exceptional character of the season and neglect of special culture may in a large measure be answerable for the low averages obtained.

Sample 15, in our opinion, is not a sugar beet. In appearance it resembles the Golden Tankard, or possibly the Giant Yellow Globe mangel, and its sugar content conforms closely to that of these roots.

Prince Edward Island.—In the report of this Division for 1900 will be found the analyses of six samples of sugar beets grown in this province. This year we present data of seven samples forwarded by Mr. Callaghan, of Charlottetown, respecting which we are informed the seed was sown between May 15 and June 1, and the roots pulled between October 15 and 20.

TABLE V.—ANALYSIS of Sugar Beets from Prince Edward Island, 1901

No.	Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root. Lbs.	Oz.
1	Not stated..........	....	9·03	13·63	66·25	5	6
2	"	Ellerslie, Prince Co.......	13·98	18·69	74·79	2	..
3	"	West River, Queen's Co...	12·54	17·09	73·37	3	13
4	"	Alberton, Prince Co	10·87	15·59	69·72	2	7
5	"	Charlottetown Royalty....	11·51	16·29	70·65	2	8
6	"	Freeland, Prince Co	11·62	16 49	70·47	2	5
7	"	Kensington, Prince Co....	11·96	17·13	69·81	2	8

These results are not so favourable as those of 1900, due very largely, we think, to improper or rather neglectful culture. The roots had not for the most part been 'earthed' and, as will be seen from the last column of the table, exceed the average weight necessary for a profitable sugar-content.

THE YIELD OF CLOVER AND ALFALFA FROM TWO AND FOUR CUTTINGS RESPECTIVELY.

The question of the relative value of the yield obtained from two cuttings as against that from four cuttings during the season has arisen in connection with the growth of clover and alfalfa. It was in order to gain some knowledge regarding this matter which might prove useful to those employing these plants, both as 'cover' crops and for 'soiling,' that the following investigation was made during the past season.

CLOVER.

A plot, one-twentieth acre, of common red clover in its second year of growth was selected. The clover had been sown in 1900 with grain. The plot was divided diagonally in order to insure greater uniformity, the north side being reserved for the four cuttings and the south side for the two cuttings. The intention was to cut the north side when about to flower, but showing no bloom, and the south side when it was considered in the right condition for cutting for hay.

North Side—Four Cuttings.—The first cutting was made on June 4, 1901, the average height of the clover being 25 inches and the plants about to flower—only two blooms being observed in the whole plot. After the plot had been carefully cut the crop was collected, weighed, and taken to the laboratory for analysis. The weights of fresh material, of the dry matter and crude protein, calculated per acre, are stated in table I.

The second cutting was taken on July 15, which was probably four or five days later than the time intended, as the crop was then found to be in full bloom. The average height was 22 inches.

The third cutting, August 15, showed that in the past month the clover had made an average growth of 8 inches. Many of the plants were in bloom.

The fourth cutting, September 18, indicated a sparse growth—in weight approximately one-half of the third cutting, though the average height of the plants was greater, viz., 13 inches. About one-tenth of the plants were in bloom.

South Side—Two Cuttings.—This half of the plot was in full bloom at the time of the first cutting, June 20, the average height of the plants being 30 inches.

The second cutting was made just one month later, July 20, the clover being again in full bloom, but with some heads withered. The condition of the crop was considered excellent for hay making.

Comparative Yields from Two and Four Cuttings.

The yields from the north side and south side and their food value may now be compared:—

Clover.	Weight of Crop per acre.	Weight of Dry Matter per acre.	Weight of Crude Protein per acre.
	Lbs.	Lbs.	Lbs.
North side (four cuttings)...........................	8,965	1,703	333
South side (two cuttings)..............................	6,900	1,445	234

From these data, it will be observed, there was obtained for the extra labour expended in two additional cuttings 258 pounds more dry matter per acre, which contained 104 pounds more crude protein than in the yield from two cuttings. We are of the opinion from a consideration of the whole experiment that the difference in yield between the two methods (though most probably always in favour of the more frequent cutting) will depend to a large degree on the stage of growth when the cuttings are made, and the time and amount of rain-fall throughout the season. With regard to the former, it is no doubt true that if the plant once forms its seed there will not be the subsequent effort to vegetative growth that there would be if the cutting were made previous to that period; and respecting the latter point, we know that clover being a moisture-loving plant a period of drought after cutting will greatly retard its future growth.

The results of this investigation can scarcely be interpreted as justifying the practice of four cuttings when the crop is to be made into hay, for we think that the extra weight and value obtained would be more than offset by the additional labour involved and the increased difficulty encountered in the drying and curing of the clover, which would contain practically about 5 per cent more moisture than if allowed to come to the period at which it is usually cut for hay. On the other hand, when the crop is intended to enrich the soil or for 'soiling' purposes the data may be taken to indicate that the more frequent cutting of the clover will prove the more advantageous, as yielding the greater amount of material that can be used either as a fertilizer or for feeding in the fresh condition.

Weights and Composition of Dry Matter in Crops of Various Cuttings.

South Side, Two Cuttings.—Compared, weight for weight, the crop of the second cutting (July 20) of the south side is worth more than that of the first cutting (June 20), from the fact that it is richer in dry matter and albuminoids. Thus we have the following data for one ton of each cutting :—

CLOVER (Two Cuttings), Dry Matter and Albuminoids per ton in fresh Material.

South Side.	Dry Matter, Per Ton.	Albuminoids, Per Ton.
	Lbs.	Lbs.
First cutting. June 20, in full bloom	405	52
Second cutting, July 20, in full bloom ; some heads withered	470	73

The dry matter as regards the relative proportion of albuminoid and non-albuminoid compounds is somewhat more valuable at the time of the second cutting, as is evident from the subjoined data:—

CLOVER (Two Cuttings), percentages of Albuminoids and Non-albuminoids in Dry Matter.

South Side.	Albuminoids.	Non-Albuminoids.
First cutting, June 20, in full bloom	12·9	2·7
Second cutting, July 20, in full bloom ; some heads withered	15·7	2·5

North Side, Four Cuttings.—Pursuing the same examination as for the south side, and first, comparing the weights of dry matter and albuminoids per ton in the crops of the four cuttings, we obtain the following interesting figures :—

CLOVER (Four Cuttings), Dry Matter and Albuminoids per ton in fresh Material.

North Side.	Dry Matter, Per Ton.	Albuminoids, Per Ton.
	Lbs.	Lbs.
First cutting, June 4, about to flower	346	50
Second cutting, July 15, in full bloom	464	67
Third cutting, August 15, about one-third in bloom	383	66
Fourth cutting, September 18, about one-tenth in bloom	498	83

As with the crop from the south side, the trend of the results shows an improvement in quality of the fresh material, both in dry matter and true albuminoids as the season advances. One ton of the fresh material from the fourth cutting has the feeding equivalent of $1\frac{1}{2}$ to $1\frac{3}{4}$ tons of that from the first cutting.

The distribution of the nitrogenous compounds in the various cuttings is made evident by the following tabular statement:—

CLOVER (Four cuttings), percentages of Albuminoids and Non-albuminoids in Dry Matter.

Clover.	Albuminoids.	Non-Albuminoids.
First cutting, June 4, about to flower	14·7	5·8
Second cutting, July 15, in full bloom	14·4	5·5
Third cutting, August 15, about one-third in bloom	17·3	3·6
Fourth cutting, September 18, about one-tenth in bloom	16·7	2·4

The increase in the albuminoids and the decrease in the non-albuminoids clearly indicate the greater feeding value of the dry matter in the crop of the two last cuttings. The similarity in composition, in respect to these compounds, of the dry matter of the first and second cuttings is marked, and the same feature is noticeable in the case of the third and fourth cuttings.

After a consideration of the amount of dry matter, that of the true albuminoids is of first importance from the feeding standpoint. We, therefore, have constructed the following tabular scheme to show the amounts of these flesh-forming constituents per acre as obtained from the data of the two plans of cutting, given in tables I. and II.:—

CLOVER—ALBUMINOIDS—Pounds per Acre.

——	South Side (two cuttings).	North Side (four cuttings).
First cutting	143	156
Second "	53	64
Third "	....	20
Fourth "	....	13
Total	196	253

These corroborate the inference already made, that the greater amount of food constituents was produced by the clover that had been cut four times in the season.

TABLE I.—Clover and Alfalfa Experiment, 1901.
Weight of Crop, Dry Matter and Protein, per Acre.

Date of Cutting.	Common Red Clover.						Alfalfa.					
	South Side (two cuttings).			North Side (four cuttings).			South Side (two cuttings).			North Side (four cuttings).		
	Weight of Crop.	Dry Matter.	Crude Protein.	Weight of Crop.	Dry Matter.	Crude Protein.	Weight of Crop.	Dry Matter.	Crude Protein.	Weight of Crop.	Dry Matter.	Crude Protein.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
June 4	....	....	....	6,125	1,062	217	....	....	....	3,230	653	131
" 20	5,460	1,107	173	....	....	....	....	....	....	....	....	....
" 21	....	....	....	....	....	....	6,400	1,574	257	....	....	....
July 15	....	....	....	1,920	446	82	....	....	....	2,240	610	92
" 20	1,440	338	61	....	....	....	....	....	....	....	....	....
Aug. 1	....	....	....	....	....	....	2,080	611	96	....	....	....
" 15	....	....	....	600	115	24	....	....	....	....	....	....
" 19	....	....	....	....	....	....	....	....	....	2,780	582	117
Sept. 18	....	....	....	320	80	15	....	....	....	1,440	292	74
Total	6,900	1,445	234	8,965	1,703	338	8,480	2,185	353	9,690	2,137	414

TABLE II.—Clover and Alfalfa Experiment, 1901—Composition of Fresh Material.

Date of Cutting.	Common Red Clover.								Alfalfa.							
	South Side. (Two Cuttings.)				North Side. (Four Cuttings.)				South Side. (Two Cuttings.)				North Side. (Four Cuttings.)			
	Moisture.	Dry Matter.	Albuminoid Nitrogen.	Non-albuminoid Nitrogen.	Moisture.	Dry Matter.	Albuminoid Nitrogen.	Non-albuminoid Nitrogen.	Moisture.	Dry Matter.	Albuminoid Nitrogen.	Non-albuminoid Nitrogen.	Moisture.	Dry Matter.	Albuminoid Nitrogen.	Non-albuminoid Nitrogen.
June 4	......	......	....	.....	82·67	17·33	·407	·160	......	......	.....	.....	79·80	20·20	·366	·280
" 20	79·73	20·27	·418	·089	......	......	....	.....	......	......	....	....	......	......	.....	....
" 21	......	......	.....	....	......	......	.....	.....	75·40	24·60	·391	·251	......	......	.....	.....
July 15	......	......	.....	.....	76·79	23·21	·536	·204	......	......	.....	.....	72·79	27·21	·531	·127
" 20	76·51	23·49	·590	·096	......	......	....	....	......	......	.....	.....	......	......	.....	.....
Aug. 1	......	......	.....	....	......	......	....	....	70·61	29·39	·505	·233	......	......	.....	.....
" 15	......	......	....	....	80·83	19·17	·533	·109	......	......	.....	.....	......	......	.....	.....
" 19	......	......	....	.....	......	......	.....	.....	......	......	.....	....	79·05	20·95	·478	·199
Sept. 18	......	......	.....	....	75·08	24·92	·668	·095	......	......	.....	.....	79·72	20·28	·558	·261

ALFALFA.

The plot for this experiment was of the same size as that for the trial with clover, one-twentieth acre. Similarly, the north half was reserved for four cuttings, and the south side for two cuttings.

North Side—Four Cuttings.—The first cutting took place on June 4. The plants had an average height of 30 inches, and from appearance, were about one week from blooming.

Second cutting, July 15. Average height of plants 28 inches. About half the plants were in bloom.

Third cutting was made on August 19, when the average height of the alfalfa was 20 inches. No bloom showing.

The date of the fourth cutting was September 18. The average height of the crop was 20 inches, and none of the plants were in bloom.

South Side—Two Cuttings.—First cutting was taken June 21. Average height of plants 39 inches.

Second cutting, taken August 1. Average height 20 inches. About one-tenth of the plants in bloom.

COMPARATIVE Yields from Two and Four Cuttings.

The difference to be observed between the yields of fresh material per acre of the north and south sides, though still in favour of the former, is not so great as in the case of the clover. Further, though we notice a corresponding increase in the crude protein of the north half, more 'dry matter' by 50 pounds was obtained from the south half (two cuttings) of the plot.

Alfalfa.	Weight of Crop per acre.	Weight of Dry Matter per acre.	Weight of Crude Protein per acre.
	Lbs.	Lbs.	Lbs.
North side (four cuttings)	9,690	2,137	414
South side (two cuttings)	8,480	2,185	353

By a reference to table II. the explanation of the larger amount of dry matter from the two cuttings (south side) will be apparent. In the first, third, and fourth cuttings (north side) the alfalfa is seen to possess 79 per cent of water, whereas the crop from the south side (cut twice) never contained more than 75 per cent water. The averages of moisture-content and dry matter are as follows :—

	Moisture.	Dry Matter.
North side (four cuttings)	77·88	22·12
South side (two cuttings)	73·00	27·00

The more advanced stage of growth in the alfalfa of the south side plot when cut, fully accounts for the smaller percentage of water.

WEIGHT and Composition of Dry Matter in Crops of Various Cuttings.

South Side—Two Cuttings.—Compared, weight for weight, the crops of the first and second cuttings, as regards dry matter and albuminoids, give data as follows :—

ALFALFA.—(Two Cuttings)—Dry Matter and Albuminoids per ton in fresh Material.

South side.	Dry Matter, per Ton.	Albuminoids, per Ton.
	Lbs.	Lbs.
First cutting (June 21)	492	49
Second cutting (Aug. 1)	588	63

As with the clover from the analogous plot, we have the greater feeding value per ton in the material from the second cutting.

The relative proportion of albuminoids to non-albuminoids in the dry matter of these cuttings is, similarly, seen to be in accord with the results obtained from clover.

ALFALFA.—(Two Cuttings)—Percentages of Albuminoids and Non-albuminoids in Dry Matter.

South side.	Albuminoids.	Non-albuminoids.
First cutting (June 21)	10·0	6·0
Second cutting (Aug. 1)	10·7	5·0

The dry matter of the second cutting is slightly more valuable than that of the first cutting.

North Side—Four Cuttings.—A comparison of the weight of dry matter and albuminoids per ton of fresh material is set forth in the next table.

ALFALFA.—(Four Cuttings)—Dry Matter and Albuminoids per ton in fresh Material.

North side.	Dry Matter, per Ton.	Albuminoids, per Ton
	Lbs.	Lbs.
First cutting (June 4)	404	46
Second cutting (July 15)	544	66
Third cutting (Aug. 19)	419	60
Fourth cutting (Sept. 18)	405	70

The fact that the percentages of dry matter and albuminoids present are influenced by certain factors, principally the number of cuttings, the stage of growth, and season, is well brought out by the above figures. On the whole, the results are in accord with those from the corresponding clover plot, showing that one ton of the fourth cutting is equal as regards albuminoids to 1½ tons, approximately, of the first cutting.

The composition of the dry matter as regards albuminoids and non-albuminoids has been ascertained.

ALFALFA.—(Four Cuttings)—Percentages of Albuminoids and Non-albuminoids in Dry Matter.

North Side.	Albuminoids.	Non-albuminoids.
	Per cent.	Per cent.
First cutting (June 4)	11·3	8·6
Second cutting (July 15)	12·2	3·0
Third cutting (Aug. 19)	14·2	5·9
Fourth cutting (Sept. 18)	17·1	8·0

The Alfalfa differs from the clover in that the non-albuminoids do not decline in the third and fourth cuttings. The percentage of the albuminoids, however, markedly increases in the latter cuttings, as was noticed in the case of the clover. We have seen that, weight for weight, the crops of the first, third and fourth cuttings contain practically the same amount of dry matter, but since, as we have observed, this dry matter of the August and September cuttings is richer in albuminoids, it follows that the crops of these later dates have the greater feeding value.

In conclusion, we may place side by side the pounds per acre of albuminoids obtained from the two and four cuttings of the alfalfa, respectively.

ALFALFA.—Albuminoids—Pounds per Acre.

——	South side.	North side.
First cutting	156	74
Second cutting	66	74
Third cutting	....	83
Fourth cutting	....	50
Total	222	281

It is somewhat remarkable that although we obtained a larger total yield, including a larger amount of dry matter, from the alfalfa than from the clover, the difference in albuminoids between that of the two cuttings and the four cuttings is the same, practically, for each crop.

CLOVER AND CLOVER ENSILAGE.

The especial value of clover as a roughage lies in the fact that it contains, in common with other legumes, a large proportion of flesh-forming constituents (albuminoids), thus allowing the use of a less weight of concentrated feed stuffs in the ration than when corn or hay forms the bulky part of the feed.

Though some farmers have not met with success in siloing clover, the causes of failure are apparently known and may be removed. Woll, in his *Book of Silage* says: 'Clover does not pack as well as the heavy, juicy corn, and, therefore, requires more weighting, or more depth in the silo, in order to sufficiently exclude the air.' Further, it is possible that the condition of the clover when put into the silo has much to do with the quality of the resulting ensilage, and regarding this point we may say that the best practice indicates that clover should be in full bloom. If allowed to remain uncut until the flower heads have withered, the clover is apparently too dry to make the best quality of ensilage. For the same reason the clover should not be allowed to wilt, but at once put into the silo.

Good clover ensilage has succulency and palatability in its favour, besides possessing, as we have said, a large proportion of the more valuable nutrients. Investigations, therefore, that seek to ascertain the best possible conditions of its preparation are worthy of our attention. Such investigations are being carried on by the Agriculturist of the Central Experimental Farm, and it is in connection with them that the analytical data about to be given have been obtained.

Mention has been made of the presence of a large percentage of nitrogenous compounds in clover, and it is in this fact that we find one difficulty in ensiling this crop. Nitrogenous substances are particularly susceptible to decomposition, especially in the presence of moisture and warmth. It was principally in order to trace the extent to which these substances had been altered by fermentation in the silo that analyses were made of the clover as put into the silo and of the ensilage taken from various parts of the silo some months later. There are and always will be certain losses in food value by ensiling, but these can be minimized to a large extent provided the clover is in the right condition and properly packed in the silo.*

The fermentative changes that take place in the silo affect both the non-nitrogenous compounds (starch, sugar, &c.), and the nitrogenous bodies. The former, to an extent depending on the degree of fermentation, are converted principally into carbonic acid and water—elements of no food value—and the latter into amides, compounds of much less value than the albuminoids. Since fermentation is kept in check by the exclusion of air, the construction of the silo and the close packing of the fresh material are matters of the greatest importance. With this outline account of the changes that take place in the silo we may proceed to consider the composition of the clover with that of its resulting ensilage, as depicted in table I.

TABLE I.—Analysis of Clover before and after Ensiling.

Constituents.	Clover as put in the Silo Aug. 31, 1900.	Clover Ensilage from centre of Silo Feb. 4, 1901.	Clover Ensilage from bottom of Silo April 11, 1901.
Moisture	76·47	82·60	77·98
Dry matter	23·53	17·40	22·02
Crude protein (nitrogen x 6·25)	3·56	2·94	2·96
Fat (ether extract)	·15	·18	·21
Carbohydrates (starch, sugar, etc.)	7·95	4·44	6·30
Fibre	9·71	7·98	10·15
Ash	2·16	1·86	2·40
Nitrogenous compounds—			
Albuminoids	2·88	1·53	2·08
Non-albuminoids	0·68	1·41	0·88

The experimental round silo in which the clover was preserved has the following dimensions: Height, 22 feet; diameter, 9 feet.

The clover was in full bloom at the date of cutting, August 31, 1900. The filling was made on three consecutive days, so that there would be but little difference in composition of the clover throughout the silo. After the ensilage had settled it filled the silo to a height of 15 feet.

* Woll, in summing up the evidence as to the relative losses in curing and ensiling clover, says: Clover silage is superior to clover hay on account of its succulency and greater palatability, as well as its higher feeding value. The last mentioned point is mainly due to the fact that all the parts of the clover plant are preserved in the silo, with a small unavoidable loss in fermentation, while in hay making, leaves and tedder part, which contain about two-thirds of the protein compounds, are easily lost by abrasion.

The first noticeable feature is the much smaller percentage of dry matter in the ensilage from the middle of the silo—the sample being taken in the centre, seven feet from the bottom—than in the clover or the ensilage from the floor of the silo. This points to a greater degree of fermentation and consequently greater loss of feeding elements in the centre than at the bottom of the silo. Weight for weight, this ensilage is not of an equal feeding value with clover. It is evident that the greater deterioration in the centre and upper part of the silo is due to the larger amount of air present, and this fact points to the value of deep silos and the packing firmly of the material. The loss has taken place both in the crude protein and carbo-hydrates (starch, sugar, gums, &c.). The crude protein consists of the albuminoids and non-albuminoid compounds (amides), and while there has been some loss in the total nitrogen, the breaking down of the former and formation of the latter explains chiefly the deterioration.

This has reference principally to the ensilage from the middle of the silo. The fat or ether extract has increased, but this is more apparent than real, for certain organic acids that are developed during the fermentation are unavoidably, by the process of analysis, determined with the fat.

TABLE II.—Analysis of Clover before and after Ensiling.

(Results on the water-free substance.)

Constituents.	Clover as put in the Silo Aug. 31, 1900.	Clover Ensilage from centre of Silo Feb. 4, 1901.	Clover Ensilage from bottom of Silo April 11, 1901.
Crude protein (nitrogen x 6·25)	15·19	16·94	13·44
Fat (ether extract)	·64	1·01	·95
Carbohydrates (starch, sugar, etc.)	33·74	25·46	29·58
Fibre	41·27	45·89	46·11
Ash	9·16	10·70	10·92
Nitrogenous compounds—			
Albuminoids	12·25	9·25	9·44
Non-albuminoids	2·94	7·69	4·00

Table II. allows us to compare closely the composition of the dry matter of the three samples, and furnishes much interesting information. While the crude protein has increased, demonstrating that the greater loss has been in the carbo-hydrates, the data for which confirm this statement, it is plain from the figures at the bottom of the table that there has been a marked decrease of the albuminoid and an increase of the non-albuminoid nitrogenous compounds. This, means a falling off in feeding value. There has been an increase in the fibre, ash constituents and ether-extract—the latter due to the development of organic acids.

These results are in close accord with those of other investigators. It is, however, probable they are more marked than if there had been a larger mass of ensilage. They certainly support the rules laid down for successfully ensiling clover, and indicate the desirability of large, deep silos, and of excluding air as far as possible by close packing of the material. By these means, fermentation will be largely controlled and excessive losses prevented.

CORN AND CORN ENSILAGE.

There are two methods of preserving corn for winter feeding in common use: by curing in shocks or stooks, and by ensiling. Both methods inevitably lead to a certain degree of loss of fodder, due to the destruction by fermentation of a portion of the carbo-hydrates and protein compounds. Many and careful experiments made and repeated in the United States in order to compare the respective merits of the two plans, have shown that the losses by field curing (stooks), as a rule, exceed those in the silo. Under favourable conditions of ensiling—that is, with a fairly mature corn, and a well constructed silo—the loss in food value by fermentation is probably less than 15 per cent, but in shocked corn the loss appears to be seldom less than 20 per cent.*

It has been abundantly shown that the dry matter of stooked corn and corn ensilage has practically an equal digestibility. We have, however, two important qualities more highly developed in ensilage than in stooked corn, viz., succulency and palatability, and this fact makes the former a much more desirable food, especially for dairy cows. On the score of labour and loss in feeding, it is generally held by practical men that ensiling is the much more economical plan.

The object in the present investigation, as in the case of the clover just recited, was to ascertain the extent to which the feeding value of the corn had suffered by ensiling.

The total loss that ensued is not deducible from our data, but the results obtained allow us to compare, weight for weight, the corn as put into the silo with the corresponding ensilage produced.

Three samples of the corn as it was being put into the silo were taken on the 14th, 15th and 27th of September, 1900, respectively. They represented the quality of the corn, (1) at the bottom of the silo ; (2) 22 feet from the bottom of the silo, and (3) 28½ feet from the bottom, or 1½ feet from the top of the silo. The silo is 17 feet in diameter and 30 feet high and was filled to the top. The weight of corn ensiled was, approximately, 150 tons.

The samples of ensilage, which were intended should correspond with the foregoing, were collected on January 31, March 1, April 3, and April 6, 1901. The January sample, it was expected, would represent the corn at the top of the silo (September 27); the March sample, that from the centre of the silo (September 15), and the two April samples, one from the bottom and the other 2½ feet from the bottom of the silo, that as first put into the silo (September 14).

The composition of the three samples of corn and four of ensilage is given in table I., the data of which allow us to compare the feeding values of the corn and corresponding ensilage weight for weight, and furnish us with an insight into the changes that occurred during the ensiling process. In table II. these changes are made more apparent by calculating the nutrients upon the water-free substance.

---

* The extent of the deterioration in shocked corn will depend upon the condition of the corn when cut, the length of time it is left shocked in the field and the character of the weather during that period.

TABLE I.—Analysis of Corn before and after Ensiling.

Constituents.	A.—Corn as put in the Silo; sample from bottom of Silo, Sept. 14, 1900.	B.—Ensilage sample from floor of Silo, April 6, 1901.	C.—Ensilage sample taken 2½ feet from bottom of Silo, Apl. 3, 1901.	D.—Corn as put in the Silo; sample taken 22 feet from bottom, Sept. 15, 1900.	E.—Ensilage sample taken 11 feet from bottom of Silo, Mar. 1, 1901.	F.—Corn as put in the Silo; sample taken 1½ feet from top, Sept. 27, 1900.	G.—Ensilage sample taken 2 feet from top of Silo, Jan. 18, 1901.
Water	81·83	81·98	76·71	83·43	77·41	80·67	84·95
Dry matter	18·17	18·02	23·29	16·57	22·59	19·33	15·05
Crude protein (nitrogen x 6·25)	1·63	1·11	1·70	1·63	2·09	1·88	1·16
Fat	0·10	0·10	0·26	0·08	0·17	0·06	0·15
Carbohydrates	9·72	9·33	12·96	8·65	11·08	10·07	6·68
Fibre	5·49	6·37	8·06	4·88	7·82	5·83	5·63
Ash	1·23	1·11	1·31	1·33	1·43	1·49	1·43
Nitrogenous compounds—							
Albuminoids or true protein	1·25	0·66	0·85	1·32	0·84	1·56	0·77
Non-albuminoids (amides, &c.)	0·38	0·45	0·85	0·31	1·25	0·32	0·39

The more important facts to be noted in connection with the percentages of dry matter are observable from the following tabular summary:—

	Dry Matter Per cent.
Bottom of Silo—	
Corn	18·17
Ensilage, floor of silo	18·02
Ensilage, 2½ feet from bottom	23·29
Middle of Silo—	
Corn	16·57
Ensilage, 11 feet from bottom	22·59
Top of Silo—	
Corn	19·33
Ensilage, 2 feet from top of silo	15·05

In the corn, the dry matter varied from 16·57 per cent to 19·33 per cent; in the ensilage, from 15 per cent to 23 per cent.

There is a very close accordance between the percentages of dry matter in the corn as first put into the silo and the ensilage as taken from the floor of the silo; such changes as have taken place have evidently not altered the material in this respect.

The most remarkable data are the percentages for the ensilage samples C (April 3), and E (March 1), in which the dry matter exceeds by 5 per cent or more that of the corn put into the silo (A and D). It is difficult to understand the character of changes that could bring about such a result. The explanation appears to lie in the fact that there was a considerable loss by leakage from the silo, owing to the unavoidably immature condition of the corn. Such would tend naturally to increase the percentage of dry matter in the ensilage.

In the ensilage taken from the top of the silo (G) we find 4 per cent more moisture than in the corn used, resulting necessarily in a similar decrease of the dry matter. This is due, we presume, to the combustion (by fermentation) of the dry matter, in which the nutrients—starch, sugar, &c. (carbo-hydrates) have suffered most.

The effect of ensiling upon the nitrogenous compounds is a marked one. The albuminoids or flesh-formers are largely reduced to the less nutritive form, amides.

The changes in the relative proportions of the nutrients are more easily followed from a perusal of the percentage composition of the dry matter of the various samples, as given in table II.

TABLE II.—Analysis of Corn before and after Ensiling.

(Results on water-free substance.)

Constituents.	A.—Corn as put in the Silo; sample from bottom of Silo, Sept. 14, 1900.	B.—Ensilage sample from floor of Silo, April 6, 1901.	C.—Ensilage sample taken 2½ feet from bottom of Silo, Apl. 3, 1901.	D.—Corn as put in the Silo; sample taken 22 feet from bottom, Sept. 15, 1900.	E.—Ensilage sample taken 11 feet from bottom of Silo, Mar. 1, 1901.	F.—Corn as put in the Silo; sample taken 1½ feet from top, Sept. 27, 1900.	G.—Ensilage sample taken 2 feet from top of Silo, Jan. 18, 1901.
Crude protein (nitrogen x 6·25)	8·94	6·18	7·28	9·69	9·23	9·63	7·71
Fat	0·54	0·56	1·12	0·46	0·74	0·33	1·00
Carbohydrates	53·52	51·75	51·38	52·36	49·10	52·18	44·34
Fibre	30·23	35·35	34·59	29·45	34·61	30·14	37·43
Ash	6·77	6·16	5·63	8·04	6·32	7·72	9·52
Nitrogenous compounds—							
Albuminoids or true protein	7·00	3·64	3·66	7·81	3·72	8·13	5·11
Non-albuminoids (amides, &c.)	1·84	2·54	3·62	1·88	5·51	1·50	2·60

The Composition of the Dry Matter of Corn and its Resulting Ensilage.

Bottom of Silo.—Contrasting ensilage B (floor of silo) with corn A, we notice that the chief differences are in the nitrogenous compounds. There has been some loss in nitrogen during ensiling, amounting to, approximately, .5 per cent, calculated on the dry matter. A much more serious loss from the feeding standpoint is to be noticed in the reduction of the albuminoids into non-albuminoid substances (amides).*

In the corn as placed in the silo (A), 80 per cent of the total nitrogen present exists in the albuminoid form, whereas in the ensilage taken from floor of silo (B), but 59 per cent is present in this more valuable condition.

Comparing the corn (A) with ensilage (C), taken 2½ feet from the bottom of the silo, we find that a further reduction has taken place, and only 50 per cent of the nitrogen compounds exist as true albuminoids.

The crude fibre has increased to the extent of from 4 to 5 per cent by ensiling. The other changes are insignificant, the principal one being a loss of about 2 per cent of the carbo-hydrates.

Middle of Silo.—Comparing the composition of the dry matter of the corn (D) with the resulting ensilage (E) taken 22 feet from the bottom of the silo, we may make the following deductions:—

The crude protein, obtained by multiplying the total nitrogen by the factor 6·25, is approximately the same in both, but a reference to the relative proportions contained therein of albuminoids and non-albuminoids reveals that there has been a notable reduction of the former to the latter. Thus, in the corn, 80 per cent of the nitrogen is in the more valuable albuminoid form, whilst in the resulting ensilage only 40 per cent is so present.

*The comparative food value of the albuminoids and amides stands approximately at 2·5 : 1, in other words the latter compounds may be considered about on a par with the carbo-hydrates.

The fat is apparently higher in the ensilage, but as organic acids, as already explained, are by the process of analysis estimated with the fat, this gain is more apparent than real.

There is a difference of about 3 per cent of carbo-hydrates in favour of the corn.

The fibre has increased by ensiling to an extent of about 5 per cent. This, of course, does not mean that there has been any development of fibre, but that other nutrients have disappeared, necessarily increasing the proportion of this constituent in the dry matter.

Top of Silo.—We notice, first, a reduction of 2 per cent of crude protein by ensiling. Examining more closely into its character it will be seen that in the corn (F) 84 per cent of its nitrogen exists as albuminoids,* whereas in the ensilage (G) this was reduced to 65 per cent. By comparing these data with those stated for the ensilage at the bottom and in the middle of the silo, it will be noted that the conversion of the albuminoids, and hence the reduction in food value, has not apparently been so great in the upper part of the silo. At all events, we can say that the ensilage in the latter contains a larger proportion of albuminoids than that in the lower portions of the silo.

Again, the apparent gain in fat is to be observed.

The dry matter of the ensilage shows about 8 per cent less carbo-hydrates than the dry matter of the corn as put into the silo, showing that fermentative changes have been active.

The fibre, the least of all the nutrients to be effected by ensiling, as in the instances already discussed, has been increased in the sample by about 7 per cent. This results chiefly from destruction of the carbo-hydrates.

In considering the foregoing deductions from this research it should be borne in mind that the corn as put into the silo was less mature than usual. The season of 1900 was not so favourable for maturing this fodder crop, as, for instance, that of the present year, when the corn as cut contained approximately 22 per cent of dry matter. This fact of the larger percentage of water in the crop of 1900 (the one under consideration) no doubt accounts in a large measure for the extent to which deterioration had taken place in the food value of the ensilage. It has been well established that mature corn, that is corn that has come to the glazing condition, yields ensilage of a greater feeding value than corn siloed when less mature. The destructive changes we have noted are largely accelerated by the great percentage of moisture in immature corn.

Further, it must be remembered that we have been considering the values of the corn and resulting ensilage compared, weight for weight. Our data do not allow us to make any inferences as to the total loss of nutrients that may have occurred in the silo.

THE GRASS PEA (*Lathyrus sativus*).

In the early part of the present year a request was received from Mr. W. J. Gerald, Deputy Minister of Inland Revenue, Ottawa, asking us to investigate the correctness of the statement that the grass pea possessed poisonous qualities and could not be fed with impunity. This pea, or rather vetch, is now being somewhat extensively grown in certain districts of Ontario, owing to its prolific character and alleged immunity to the attacks of the pea weevil. It has thus found its way, perhaps to the extent of 2 per cent or thereabouts, into the peas exported to England, from whence the objection above referred to came.

It is the grain of this plant that, according to many learned authorities, causes the disease known as lathyrismus, a form of paralysis, which occurs in India when, in times of famine, large numbers of the natives are obliged to live upon it, practically,

*In the corn samples A and D this percentage was approximately 80. The larger proportion in the corn (F) is due to the more mature condition of the plant when cut—some twelve days later than A and D.

exclusively. Much has been written upon the subject and many theories advanced as to the nature of the poison. Statements have appeared to the effect that a volatile alkaloid, which has a toxic action, has been isolated from the seed, but all the announcements to the effect that a poisonous principle has been identified—and they are several—appear to lack definiteness and verification. As might be supposed, the matter has received investigation at the hands of chemists and physiologists. In this connection we may state that Professor Wyndham R. Dunstan, director of the laboratories of the Imperial Institute, England, has for some time past been engaged on this difficult problem, working on Indian seed, so far, we understand, without being able to isolate any poisonous principle. We may, therefore, say that as yet nothing of a definite character has been evolved from chemical examination, and that the real nature of the cause of lathyrismus is shrouded in mystery, though there is a strong probability that the thorough researches of Professor Dunstan now in progress will eventually furnish data of a satisfactory nature.

In the endeavour to ascertain whether the grass pea as grown in Canada is identical with that of India, plants were grown by us from seed obtained in western Ontario and from seed which came from the north-western provinces of India, the latter being kindly furnished by Professor Dunstan. The bloom of these plants was examined for us, in the absence of the botanist of the farms, by Professor Bemrose, of the Pharmaceutical College, Montreal, to whom I am indebted for a most careful report on the same. He says that there are no essential or important differences to be observed between them, and that both belong to the same species, *L. sativus*. The flowers from the Indian seed are blue, while those from the Canadian seed have proved with us invariably white. This, however, is not regarded as denoting any fundamental or specific difference, since the flowers of many members of this order are known, under the same conditions, to vary in colour—that is, may appear as white, blue or purplish.

Certain differences are, however, to be noted between the Indian and Canadian seed. Both are alike in having the flattened wedge-shape, but the former are dark gray to very dark brown in colour and mottled, and possess a dark or black line running two-thirds round the seed, while the latter, as far as is known to the writer, are invariably white or greenish-white. Whether these marked characters denote varietal differences it would be hazardous to say, but at all events they are worthy of mention in a consideration of this subject.

We submitted the Canadian grown seed to a very careful and thorough investigation, following the elaborate scheme of Dragendorff for the isolation of alkaloids, glucosides, &c., and also employed several other special processes for the detection of poisonous principles. Quantities varying from 300 grams to 1,500 grams (11 ounces to 3½ pounds) were used in the various processes of analysis. In no case, however, was any poisonous principle or alkaloid obtained, all the results being negative in character.

A feeding test was then instituted under our immediate supervision. Two fowls (a cock and hen) were fed on this grain, practically exclusively from April 17 to June 28, 72 days. At the end of this period both fowls were in excellent condition, lively and healthy. During the experiment they always had a good appetite and ate the peas with avidity. They were kept on other grain, principally oats, from June 28 to August 20, in order to notice if any after effects of the pea ration might manifest themselves, but the fowls remained healthy. In connection with this experiment the following data were obtained and will be found of interest in showing that no injurious results followed the consumption of the grass pea.

During the 72 days of trial the fowls ate 23 pounds 3 ounces of grain. All that they would eat was given to them twice daily, the amount varying from 1½ ounces each at first to 3½ ounces as they became accustomed to the feed, the average being from 2½ to 2¾ ounces each per diem.

The hen laid 13 eggs during the time of the experiment, in spite of the confined quarters and the lack of that variety of food usually considered necessary for egg production.

The weights of the fowls as taken during the trial were as follows :—

—	Cock.		Hen.	
	Lbs.	Oz.	Lbs.	Oz.
April 27	3	1½	2	11½
July 2	3	15	3	15
August 20	3	15	4	1

It is thus seen that both fowls gained in weight on this diet.

Subsequent to the foregoing experiment we made the following investigation to ascertain if the oil or fat of this pea possessed any toxic properties. A considerable quantity of the finely ground peas was repeatedly exhausted by redistilled gasolene. Finally, this solvent was allowed to evaporate spontaneously and the resulting fat, weighing 1½ grams, was made up with starch and several capsules filled with the mixture. These capsules were slipped down the throat of the hen. Though a careful watch was kept for more than a week, no harmful results were noticeable, the hen remaining bright and lively and evidently in good health.

We purpose continuing this research, but it is satisfactory to note that all the work done points to the non-injurious character of the Canadian grown seed.

It may be added that we have received the testimony of several farmers in western Ontario who have largely fed this pea. In no instance have they recorded any injurious results or symptoms, and they report it as a valuable and harmless feed for all classes of stock.

In conclusion, it will be of interest to place side by side the food analysis of the Canadian and Indian grown seed. The former has been made in our laboratories; the latter is taken from Watt's Dictionary of Economic Products of India:

	Canadian.	Indian.
Moisture	11·51	10·10
Albuminoids	26·12	31·90
Fat	·93	·90
Carbo-hydrates	53·78	53·90
Fibre	5·04	
Ash	2·62	3·20
	100·00	100·00

The chief point of difference lies in the percentage of albuminoids, which in the Indian seed appears to be abnormally high, and there seems some ground for doubting the correctness of this determination.

CORN BY-PRODUCTS: GLUTEN MEAL, GLUTEN FEED, ETC.

We have reason to know from correspondence that our dairymen and stock-feeders are yearly paying more attention to the quality of the feed they use, and especially to that which it is necessary to buy to supplement the home-grown fodder. This is an encouraging sign, for, speaking generally, the profitable production of milk and flesh can only follow the economic purchase and use of the 'concentrates' of the ration, which we notice have recently risen considerably in price. This demands primarily a knowledge of the composition of these materials.*

* Information regarding the functions of the various constituents of fodders in the animal system, their digestibility and the desirability of a balanced ration, has been furnished in reports of this Division for 1890, 1892 and 1898.

These as has been stated, are bought to supplement and balance the coarse fodders of the farm, or, in other words, to furnish protein and fat, and consequently it is according to the percentages of these constituents that they must be valued. Prominent among them are the various milling by-products of wheat, oats, and Indian corn. It is of the latter, since they are comparatively new in our markets that we shall here treat, giving analyses of several made during the past year in the farm laboratories.

The establishment in Canada of starch factories has resulted in the production of a number of materials derived from the corn kernel which can be used to advantage as cattle feed, but which differ in their value according to the part of the grain entering into their composition.

The corn kernel, for our present purposes, may be considered to consist of (1) the husk or skin, which is fibrous; (2) a layer of more or less yellow cells containing a large proportion of gluten; (3) the larger mass or body of the kernel, nearly pure starch; and (4) the germ, rich in protein, but especially so in fat and mineral matter. In the preparation of the starch, all save this constituent find their way into the by-products, sometimes singly, sometimes mixed. Though all manufacturers do not adopt precisely the same terms, the following have been commonly accepted: Gluten meal, especially rich in protein, and also containing a large proportion of oil ; Germ meal, the dried and ground germ, and consequently high in protein and very rich in oil ; Corn oil cake, and corn oil meal, the germ from which the large amount of oil has been expressed, but still very rich in this constituent ; Corn bran, the hulls or skin of the corn, much lower in feeding value than any of the preceding ; and Gluten feed, which consists of all the by-products mixed, and may be regarded as corn minus its starch, containing large percentages of protein and oil, but not so rich in either as gluten meal.

These definitions will prove useful as a guide, but since some manufacturers employ the terms rather loosely, as, for instance, gluten meal to designate the mixture of all the by-products (gluten feed), and further, that methods of preparation differ, a fact which affects the composition of the product, they should not be depended upon solely. An analysis showing the percentages of protein and oil should be asked for, so as to allow the purchasers to estimate the comparative values of the brands offered.

The subjoined table gives the composition of the more important brands produced in Ontario, as determined from samples obtained from the manufacturers or their agents. In several instances results from two or more samples of the same brand received at different dates are given.

ANALYSIS of Gluten Meals, 1901.

No.	Brand.	Manufacturer.	Moisture.	Protein.	Fat.	Carbo-hydrates.	Fibre.	Ash.
			p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
1	Maize gluten meal, Jersey Brand.	St. Lawrence Starch Co., Port Credit, Ont.	5·93	18·63	7·25	64·10	4·04	·65
2	" "	" "	8·76	17·31	7·69	61·33	4·36	·55
3	" "	" "	7·03	16·44	6·11	64·01	5·75	·66
4	Gluten meal	Brantford Starch Co., Brantford	6·61	17·18	9·95	59·58	6·01	·67
5	Corn gluten meal..	Edwardsburg Starch Co., Cardinal, Ont.	5·25	36·68	11·05	43·83	1·54	1·65
6	" "	" "	7·68	37·87	6·80	45·49	1·05	1·11
7	Corn oil cake*...............	" "	3·21	21·19	36·49	31·65	6·61	·85
8	Germ feed†................	" "	4·62	13·81	8·53	56·45	15·79	·80

* This sample is evidently not a normal 'oil cake,' but rather the germs from which a small percentage of the oil has been expressed.

† This should be known rather as corn bran, since it consists largely of the hulls or skin of the corn.

Although corn is a grain poor in protein and mineral matter, and, therefore, not suitable for use as the sole grain, it is seen that many of its by-products are very rich in these constituents, besides containing large amounts of fat. These products may, therefore be considered as valuable adjuncts to our list of concentrated feeds, wholesome and nutritious, and eminently adapted to forming a part of the grain ration, both both for milch and fattening stock.

CATTLE FEED.

At the request of the Department of Marine and Fisheries, Ottawa, analysis has been made of two samples termed 'Cattle Feed,' to ascertain their feeding value. The object of the investigation was to learn which would be the more nutritious as food for cattle in transport to England.

These 'feeds' consist chiefly of crushed or partially ground oats and Indian corn, the proportion of the former to the latter being apparently somewhat greater in No. 1 than in No. 2. A few weed seeds and small grain (cereals) are to be observed in both samples, though there are no indications of 'mill sweepings' having been used in their preparation. A general examination of the samples showed a strong similarity in composition, but that of No. 1 is probably somewhat the better of the two. This conjecture is borne out by the chemical data, which are as follows:—

	No. 1.	No. 2.
Moisture	9·18	9·30
Protein	12·81	10·75
Fat	3·90	4·63
Carbo-hydrates	61·09	61·28
Fibre	10·00	11·37
Ash	3·02	2·67
	100·00	100·00

The chief points of difference are, (1) that No. 1 is somewhat the richer (2 per cent) in albuminoids and that No. 2 contains a little more fat, approximately, ·75 per cent.

The albuminoids (protein) and fat constitute the most valuable nutrients of a fodder, and are usually assumed to be worth, weight for weight, 2½ times the carbohydrates (starch, sugar, &c.). On this basis we find by calculation that one ton of No. 1 feed is equal in feeding value to 1 ton 63 pounds of No. 2. If No. 1 is worth $15 per ton, then the value of one ton of No. 2 would be $14.54.

In arriving at these conclusions, we have been obliged to assume the feeds to be of equal digestibility, and the probability is that in actual feeding the difference in favour of No. 1 will be a little greater than shown by the foregoing computations.

RICE FEED.

This material, a by-product in the preparation of rice, is of considerable feeding value. Rice hulls are very fibrous and woody, but the bran coats of the seed, the germ and the rice 'polish' are all more or less rich in protein, fat and mineral matter.

The sample examined was forwarded by Mr. Peter Reid, Chateauguay Basin, Que., who states that it was obtained from the Mount Royal Milling Company's mill at Cote St. Paul. He gives the price (Nov. 20, 1901) at $18 per ton, and says : 'The meal is made from the husk of the grain, corresponding to the bran of wheat, I presume, together with particles of the grain broken off when running through the husker and polisher.'

Composition of Rice Feed.

Moisture	8·39
Protein	12·31
Fat	12·39
Carbo-hydrates	47·51
Fibre	11·11
Ash	8·29
	100·00

We should presume this to be an excellent feeding stuff for dairy cows. Its mechanical condition is favourable to the digestion of the feed, and its composition is such that all the desired nutrients are furnished in good proportion.

In 1892 we analysed a sample designated 'Rice Meal,' forwarded from Victoria, B.C. Its composition was as follows:—

Moisture	11·47
Protein	11·34
Fat	12·75
Carbo-hydrates	50·31
Fibre	6·95
Ash	7·18
	100·00

This sample evidently contained a smaller proportion of hulls than the 'feed' under consideration, but otherwise they are of a similar character.

For the purposes of comparison, we insert the following data of rice and its products, taken from 'Analysis of American Feeding Stuffs, Jenkins & Winton.'

—	Water.	Protein.	Fat.	Carbo-hydrates.	Fibre.	Ash.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Rice	12·4	7·4	·4	79·2	·2	·4
Rice meal	10·2	12·0	13·1	51·2	5·4	8·1
Rice hulls	8·2	3·6	·7	38·6	35·7	13·2
Rice bran	9·7	12·1	8·8	49·9	9·5	10·0
Rice polish	10·0	11·7	7·3	58·0	6·3	6·7

BIBBY'S CREAM EQUIVALENT—CALF MEAL.

An experiment was recently conducted in calf feeding at the Central Experimental Farm, in which this material formed one of the feeds under trial. It was, consequently, deemed advisable to ascertain its feeding value, as far as that could be learnt from a chemical and microscopic examination. This is an English preparation, used as a partial substitute for milk in the rearing of calves, and costs $3.50 per cwt. at Ottawa. It has a slight, pleasantly aromatic odour in which that of locust bean is particularly noticeable.

Composition of Calf Meal.

Moisture	10·40
Protein	12·75
Fat	11·19
Carbo-hydrates	57·88
Ash	3·08
Fibre	4·70
	100·00
Water soluble extract	17·29
Saccharine matter, in water soluble extract	6·40

A microscopic examination reveals the presence of linseed meal and bean (probably locust) meal as the chief ingredients.

It will be of interest to compare the ratio of the chief constituents of this food with that given by milk, in order to learn how far this substitute approximates milk in the balance of its nutrients. To do this we shall have to assume that the digestibilities of the protein, fat, and sugar in both are equal. This is not strictly accurate, and gives an advantage to the calf meal, but is rendered necessary by the fact that we have no data as to the digestibility of this material.

Approximate Ratio of Nutrients in Milk and Calf Meal.

	Protein.	Fat.	Carbo-hydrates.	Ash.
Milk	10	11	13	2
Calf meal	10	9	45	2

Save for the excess of carbo-hydrates, the balance of nutrients in the calf meal is very well preserved. Only one-ninth of the carbo-hydrates, however, is present as sugar (6·40 per cent), and, therefore, immediately digestible, or rather, assimilable ; whereas in milk, the sugar constitutes the whole amount of the carbo-hydrates, and is entirely digestible. This, in a measure, affects the calculation, but yet not to such an extent as to prevent drawing the conclusion that in the essential relationship of the nutrients, and more particularly between the protein and fat, this substitute is not unlike milk.

Of course, such feeds, no matter how well compounded, can only be considered, at best, as partial substitutes for milk, and the proportion in which they can be advantageously used will depend not only on their composition, but also on their price.

CANADIAN POTATO STARCH.

At the request of the Inland Revenue Department, Ottawa, we have submitted to a careful analysis a sample of potato starch from the mills at Baie du Febvre, Yamaska, Quebec.

A chemical examination as to the purity of the starch afforded the following data:—

Moisture	16·70
Ash or mineral matter	·67
Nitrogen	·017
Fibre or cellulose	None.

Moisture.—According to Allen (*Commercial Organic Analysis, Vol. I., p. 418*) 'The proportion of water in air-dried starch averages about 18 per cent, but is liable to variation.' It is clear from this statement, therefore, that the sample under consideration is in this respect quite equal to the standard brands upon the market.

Ash or Mineral Matter.—Pure starch does not contain any ash, but commercial starch, since it usually possesses traces of foreign matter, such as vegetable fibre, nitrogenous substances, &c., frequently shows a small percentage of mineral matter derived from these constituents. The very small amount we have found present in this sample would not, in our opinion, detract in any way from its value for those purposes for which potato starch is employed. In this respect, however, it seems to be scarcely equal to some of the finer starches used in cooking.

Nitrogen.—The above recorded percentage shows that this sample contains traces only of albuminoid matter.

Fibre.—Analysis did not reveal the presence of any appreciable amount of vegetable fibre.

Reaction.—This starch has a slightly acid reaction, though no traces of mineral acids could be detected. Presumably this trace of acidity is developed during its manufacture. Most probably this feature would not affect in any way the value of the starch, but on this point there are no data at our command. Such samples of corn and rice starch as we have examined have been invariably found to be slightly alkaline.

Microscopic Examination.—A few fragments of foreign material, evidently vegetable tissue, are discernible. Many brands of commercial starch contain such traces, their presence being due to imperfect separation in manufacture, but the very finest qualities are stated to be so pure in this respect as to be free even from traces of fibre or tissue.

CANADIAN BUTTER AS EXPORTED.

In March of the present year we received a request from the Department of the Secretary of State, Ottawa, to analyse and report upon a sample of Canadian butter that had been condemned and prohibited from sale in Cuba on the ground that it was adulterated, the custom's analyst at Havana having certified that it contained 35 per cent oleomargarine. Unopened samples of the butter from the condemned consignment had been returned at the instance of the Secretary of State, and these were forwarded to the Farm laboratories. Having submitted the butter to a very careful and complete examination, we made the following report, which in the fullest way bears out the claim of the manufacturer and exporter, that the butter is pure and unadulterated.

ANALYSIS AND REPORT.

Butter received from the Department of the Secretary of State, Dominion of Canada, and contained in a 2-lb. tin, hermetically sealed and bearing the following marks:—'Extra Finest Canadian Butter, Pierre de Bacourt, Central Creamery at Scott Junction, Dorchester, Canada.' Written in ink on bottom of tin is '9478 R. Truffin & Co., ss. *Mexico.* September 17, 1900, 4 cases, out of case No. 636.' Tin bound with tape and seals intact 'Deputy Collector (official) of Customs.'

Analysis.

Fat	83·15
Water	10·70
Salt	4·02
Curd, by difference	2·13
	100·00

Estimations on the dry, filtered Butter-fat.

*Reichert No. (volatile fatty acids)	27·45
Saponification equivalent (Koettstorfer)	249·3
Specific gravity at 100° F.	·912

* Corresponding to 5 grams fat.

Paraffin could not be detected, even in traces.

The above data are entirely in accordance with those of pure, unadulterated butter, and conclusively prove the absence of oleomargarine or other foreign fats.

CHEMISTRY OF INSECTICIDES AND FUNGICIDES.

ANALYSIS OF CERTAIN BRANDS OF LYE.

Solutions of lye are used for the destruction of insects and cleansing the bark while the wood is still dormant, that is, before the leaves appear. In response to requests from orchardists, both in Ontario and Nova Scotia, for information regarding the relative values or strengths of the better known brands of lye sold in Canada, we have during the past season submitted to analysis, Gillett's 'Perfumed 100 per cent Lye,' Greenbank's 'Soapmaker,' Babbitt's 'Pure Potash or Lye,' and a sample of 'Rock Potash' obtained from a wholesale drug firm in Montreal.

Our results may be tabulated as follows:—

	Alkali Present as Caustic Soda.	Alkali Present as Carbonate of Soda.
Gillett's Perfumed 100 per cent Lye	92·48	2·77
*Babbitt's Pure Potash or Lye....	85·15	4·98
Greenbank's Soapmaker	71·44	5·51

*There is no potash in Babbitt's brand, the alkali present being soda.

The analysis of Rock Potash showed:—

Alkali, as caustic potash	36·72
Alkali, as carbonate of potash	43·24
The total potash present, calculated as oxide, is....	69·31

These, of course, are all commercial products and consequently contain varying amounts of chloride of soda, and in some instances certain sulphates, besides oxide of iron and alumina. These impurities, however, do not interfere with the efficiency of the material for the use here considered. The relative strength of the lyes as a wash is indicated primarily by the amount of caustic alkali contained, and, secondarily, by that of the alkali as carbonate. The use of Rock Potash would furnish an important fertilizing element, absent in the ordinary brands of lye upon the market.

GAS-LIME.

Gas-lime is a by-product in the purification of illuminating gas, and may frequently be obtained for the cartage. It has a certain value for the destruction of the larvæ of noxious insects, slugs, centipedes, &c., in the soil, but must be employed with some caution owing to the fact that when fresh from the gas works it is injurious to vegetation. These injurious properties which really give this material its insecticidal value, are chiefly due to certain sulphur compounds (principally sulphide of lime), but sometimes in a measure to more or less tar and other organic compounds that may be present. Thoroughly weathered gas-lime, as when left in small heaps on the field for two or three months, however, has lost for the most part its injurious qualities by

the more or less complete conversion of the sulphide and other sulphur compounds into sulphate of lime (gypsum), which as we know, is a valuable fertilizer especially for soils deficient in lime. To this end, therefore, it is advisable to spread the gas lime, or to place it in small heaps, on the field in the autumn, ploughing or harrowing under the following spring.

As an insecticide, pure and simple, its action of course will be more pronounced if at once (without weathering) it is ploughed or harrowed into the soil ; but by so doing there would be some danger of injuring vegetation.

Naturally, gas-lime is variable in composition, and consequently it is difficult to state the limit to which it can be safely applied, but the usual amount will be between 2 and 6 tons per acre, and speaking generally we should advise a trial with the lesser quantity. In Holland it has been used freely on heavy clay soil to the extent of 2 to 2½ tons per acre. In England, applied in autumn from 2 to 4½ tons per acre. It is stated to act injuriously if applied directly to grass lands during the growing season.

An analysis of gas-lime made in the farm laboratory appears in the report of this Division for 1890, to which is appended an account of the value of this material from the standpoint of a fertilizer.

NOTES ON INSECTICIDAL MIXTURES.

The following information in answer to inquiries submitted through the Entomological Division, is inserted as of general interest to fruit growers :—

Proposed Mixture of Lime-wash and Soft Soap.—The correspondent wished to know if the good qualities of these materials could not be obtained in the one mixture, and thus half the labour of application saved. Experiments were made in the laboratory, using thin lime-wash and whale-oil soap, and the results obtained confirmed our conjecture as to the unsuitability of the mixture.

A curdy lime-soap is precipitated, which in our opinion would not be so effective as the original (potash) soap. Further, we believe, the mixture would be found to have very poor adhesive qualities.

The Addition of Washing Soda or Lye to the Soft Soap solution.—We were asked if there would be any advantage in adding lye or sal soda to the soft soap wash.

There is no chemical reason against this practice, and the mixture would be stronger, *i.e.*, more caustic, than the soap solution alone. There must, however, be a limit to the proportion in which lye could be so used, for if the mixture were too caustic there would be injury to the bark. Naturally, one would expect a soft soap solution, strengthened with lye, to be more effective as an insecticide than the former alone or with washing soda.

The relative value of Soft Soap and Whale-oil Soap in insecticidal preparations.—It is scarcely possible to say from the chemical standpoint which of the two—soft soap or whale-oil soap—would be the more effective, though we might expect that a determination of the excess of free alkali present would give an indication in that direction. This, no doubt, varies somewhat in each sample. Whale-oil soap most probably owes its virtue in a large part to its qualities as a deterrent, and in this respect it must certainly be considered as more effective than a soft soap made with a vegetable oil.

On the use of Sal Soda instead of Lime in the Paris green mixture.—In answer to the inquiry: 'Can sal soda be used instead of lime in the preparation of Paris green mixture?,' the following information is submitted:—

When Paris green mixed with water (at the usual rates of 1 pound to 100-200 gallons) is applied to certain classes of delicate foliage (as of stone fruits) a corrosive or 'burning' effect has been noticed to follow, the leaves showing decided marks of injury as the insecticide dried upon them. This is due to a certain small percentage of free (uncombined) arsenic. This injurious effect may be entirely overcome by the addition

of a small quantity of lime, the usual amount advised being 1 pound to each 1 pound of Paris green, though this is probably much more than is absolutely necessary.

Sal soda (more commonly known as washing soda) should chemically effect the same purpose as the lime, though in the apparent absence of recorded experimental data it would not be wise to generally advise the substitution. Arsenate of soda, as is well known, is more or less injurious to foliage, but the compound formed in the mixture under discussion would rather be arsenite of soda, regarding the action of which on foliage I cannot find any reference. I, however, am of the opinion, drawn from a general consideration of the whole subject, that lime would be better, or rather, safer to use, since the soda-arsenic compounds are easily soluble in water, and hence more likely to affect the foliage.

To obtain the neutralizing effect of 1 pound of slaked lime, approximately 4 pounds or ordinary crystallized washing soda would be required. This quantity of lime, however, as already pointed out much exceeds that absolutely necessary, and most probably 2 pounds washing soda (equivalent to ½ pound of lime) would be ample. An experiment recently made here showed that when 4 pounds of sal soda in solution were added to a mixture of 1 pound of Paris green in 160 gallons of water, considerable traces of arsenic went into solution ; in other words, that there had been a slight decomposition of the Paris green. When, therefore, through inability to conveniently obtain lime, sal soda is substituted, we should advise not more than 2 pounds to each pound of Paris green ; but in view of the general results of soluble arsenic compounds on foliage, and in the absence of any definite data from spraying experiments with the mixture under discussion, it would be safer to use lime whenever possible. The arsenate of lime that may be formed in the fluid from following this course has been shown to be non-injurious to foliage and an excellent insecticide.

It might be pointed out that when Paris green is used in Bordeaux mixture there is no need for further addition of lime, to prevent injury to foliage, and that in this mixture both the fungicidal and insecticidal properties are unimpaired.

WELL WATERS FROM FARM HOMESTEADS.

For the year November 30, 1900, to December 1, 1901, 96 samples of well waters have been received for analysis. From the tabulated statistics in the letter of transmittal it will be seen that while the largest number of samples were received from Ontario, farmers in every province of the Dominion have availed themselves of the privilege extended to them in this matter.

Owing to insufficiency in the quantity sent, to dirty bottles or corks, &c., it was found impossible or inadvisable to submit to analysis a number of the waters received, and in this connection it may be well to again point out that the necessary instructions to be followed in collecting and shipping the sample will be forwarded to farmers and dairymen upon application.

We would further state that the examination of mineral or supposed medicinal waters is not undertaken.

Each water, as analysed, is reported upon to the sender and such advice given or suggestions made regarding the water supply as the results would justify. These reports cannot be inserted here, for want of space, but a brief statement regarding the quality of the waters will be found in the last column of the appended table of data.

Of the 64 waters submitted to complete analysis, 19 were reported as pure and wholesome, 18 as decidedly suspicious and probably dangerous, 16 as seriously polluted, and 11 as saline waters.

ANALYSIS OF

RESULTS STATED IN

Number.	Locality.	Marks.	Date.	Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.
			1901.				
1	Elgin, Ont	R. B. R	Jan. 11.	·078	·343	21·83	370·0
2	Lot 9, Con. 1, Gloucester, Ont.	J. O'C	" 30.	16·57	·325	·28	3500·0
3	Pond near Toronto, Ont	J. M	Feb. 2.	·27	·22	2·594	9·0
4	Melita, Man	A. E. E	" 4.	....	....	....	....
5	Archer, Ont	J. F. C	" 20.	·015	·058	·915	2·2
6	Norway, Ont	S. H. J	" 21.	12·83	·512	1·089	3·9
7	Glenella, Man	W. J. F	Mar. 5.	·05	·383	·0972	202·0
8	Gloucester, Ont	J. O'C. No. A	" 9.	5·735	·203	·202	319·8
9	" "	" " B	" 9.	1·45	·107	None.	349·0
10	Shelbourne, Ont	R. A. R	" 23.	·105	·073	·065	·1
11	Abbotsford, Que	Wm. C	" 27.	Free.	·054	1·672	16·4
12	Orange Ridge, Man	R. C	" 29.	....	....	....	960·0
13	McKenzie, Man	W. W	April 2.	·036	·266	·0099	·1
14	Beachburg, Ont	J. D	" 6.	1·545	·75	·088	11·0
15	Pilot Mound, Man	A. B. W	" 23.	1·695	·197	None.	85·0
16	Millerton, N. B	F. P. E	May 23.	·01	·068	·527	4·0
17	Vankleek Hill, Ont	H. D	June 4.	·645	·10	·0288	10·0
18	Peachland, B. C	R. H. H	" 14.	·036	·021	·003	·4
19	Sweetsburg, Que	R. D. W	" 14.	·012	·054	1·06	None.
20	Pleasant Valley, Ont.	J. H	" 22.	·012	·23	5·77	51·0
21	Bathurst, N. B	T. M. B	" 25.	·032	·069	·023	320·0
22	Alexander, Man	T. S	July 3.	·016	·228	·392	560·0
23	Ottawa, Ont	W. L. S	" 8.	·024	·205	·0856	1·2
24	Chatham, N. B	J. N. No. 1	" 15.	·048	·03	·0329	650·0
25	" "	" 2	" 15.	·008	·02	·023	660·0
26	" "	" 3	" 15.	·022	·026	·0115	80·0
27	" "	" 4	" 15.	·024	·063	·0675	48·0
28	Pictou, N. S	W. M. D	" 15.	·172	·093	·0593	9700·0
29	Barrie, Ont	W. A. R	" 22.	·036	·11	2·157	12·8
30	Brampton, Ont	W. F. J	" 24.	·014	·088	2·608	84·0
31	Arnprior, Ont	A. R	" 24.	·012	·044	·507	None.
32	Ville Marie, Que	F. D	" 25.	·066	·143	4·40	13·8
33	Toronto, Ont	S. H. J	" 26.	18·12	·505	·885	26·8
34	Lavant Station, Ont	Thos. L	" 27.	·072	·548	8·149	240·0
35	Brome Corner, Que	F. H. P	" 27	·02	·04	·105	·8
36	Summerside, P. E. I	L. B. H	" 29	·012	·036	5 40	39·8
37	Niagara, Ont	A. B	Aug. 2	·31	·054	·278	420·0
38	Britannia on the Bay, Ont	A. L	" 10	·275	·208	·0304	10·8
39	St. Catharines, Ont	F. B	" 14.	7·625	·168	None	72·0
40	Newcastle, Ont	Wm. R	" 17.	·016	·119	15·14	94·5
41	Bideford, P. E. I	Wm. R	" 22.	·016	·093	14·91	67·0
42	" "	J. R	" 22.	·02	·038	10·57	82·0
43	Port Sydney, Ont	A. L. F. B. No. 1	" 29.	·128	·232	·813	8·0
44	" " "	" 2	" 29.	·12	·172	2·826	9·0
45	" " "	" 3	" 29.	·08	·236	·092	10·5
46	Knowlton, Que	Hon. S. F	" 30.	None.	·106	None.	·7
47	Ripon, Que	J. T. No. 1	Sept. 19.	·096	·168	·035	3·0
48	" "	" 2	" 19.	·626	·073	·017	920·0
49	Woodman's Point, Westfield, N. B	F. H. J. R	" 26.	·076	·022	2·261	44·9
50	Rideauville, Ont	D. M	" 26.	·730	·318	None.	5·2
51	Bloomfield Station, N. B	W. S. S. W	Oct. 1.	None.	·024	None.	5·8
52	Chatham, N. B	W. S. L	" 1.	None.	·052	1·538	20·0
53	Rossland, B. C	A. J. Mc	" 9.	·102	·093	·056	3·0
54	Headingly, Man	H. A. W	" 25.	2·41	2·51	·0494	4110·0
55	Summerside, P. E. I	P. P. Co. No. 1	Nov. 4.	·074	·112	3·562	25·0
56	" "	" 2	" 4.	·026	·05	6·55	52·9
57	" "	" 3	" 4.	Trace.	·02	2·314	13·4
58	" "	" 4	" 4.	None.	·09	4·653	27·0
59	" "	" 5	" 4.	·03	·02	4·208	26·1
60	" "	" 6	" 4.	None.	·046	4·809	37·5
61	Thornhill, Ont	D. J. No. 1	" 9.	·06	·27	5·213	67·0
62	" "	" 2	" 9.	·185	·225	12·05	145·0
63	" "	" 3	" 9.	·555	·405	·0782	6·5
64	Orton "	E. L. C	" 22.	·288	·156	1·795	1·9

WELL WATERS, 1901.

PARTS PER MILLION.

Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.	Number.
2390·0	1995·2	394·8	H. traces	Contaminated and unwholesome	1
6135·6	5594·8	540·8	V. H. traces	Very suspicious—Strongly saline	2
299·6	191·6	108·0	H. traces	Probably contaminated	3
5533·0	5269·0	264·0	H. traces	Saline water	4
313·2	254·4	58·8	None	Free from all organic pollution	5
341·2	198·8	142·4	H. ppt	Polluted and dangerous to health	6
7101·0	5708·0	1393·0	None	Saline water	7
5524·0	5288·8	235·2	Traces	Strongly saline	8
1257·0	1133·0	124·0	Traces	Saline water	9
252·0	152·8	99·2	V. Sl. traces	Probably free from contamination	10
324·0	244·0	80·0	Traces	Suspicious	11
6276·0	5880·0	396·0	Traces	Strongly saline	12
411·2	145·6	265·6	V. H. traces	Not polluted	13
460·0	258·4	201·6	H. ppt	Seriously contaminated	14
3000·0	2635·0	365·0	None	Saline water	15
50·5	29·0	21·5	Traces	Free from all injurious contamination	16
302·0	215·0	87·0	H. traces	Suspicious	17
87·5	58·0	29·5	Traces	Pure and wholesome	18
102·0	69·5	32·5	Traces	Safe and wholesome	19
388·0	250·0	138·0	Sl. traces	Seriously polluted	20
686·5	567·5	119·0	None	Free from organic impurities	21
4900·0	3796·0	1104·0	Traces	Saline water	22
62·0	23·0	39·0	None	Pure and wholesome	23
1175·2	993·2	182·0	Traces	Free from organic impurity	24
1156·8	1006·4	150·4	Traces	" " "	25
231·2	199·2	32·0	Traces	" " "	26
182·4	116·4	66·0	V. Sl. traces	" " "	27
16744·0	16309·0	435·0	Sl. traces	Saline	28
240·8	154·4	86·4	Traces	Decidedly suspicious	29
890·0	676·0	214·0	V. Sl. traces	" "	30
388·0	96·8	291·2	V. Sl. traces	Free from organic pollution	31
134·4	50·4	84·0	None	Dangerously polluted	32
443·6	251·2	192·4	H. traces	Very seriously contaminated	33
1264·8	787·2	477·6	Traces	Contaminated and unwholesome	34
82·8	54·4	28·4	None	Free from organic pollution	35
358·4	222·4	136·0	H. traces	Seriously contaminated	36
1054·8	999·6	55·2	None	Of doubtful purity	37
208·8	148·0	60·8	Sl. traces	Contaminated	38
1094·4	....	....	H. ppt	Polluted with drainage	39
831·2	540·0	291·2	None	Seriously contaminated	40
529·0	252·0	277·0	Traces	Highly suspicious	41
463·0	251·0	212·0	V. Sl. traces	Seriously polluted	42
133·0	97·0	36·0	None	Highly suspicious	43
105·6	68·0	37·6	Traces	Seriously contaminated	44
84·5	53·5	31·0	None	Good and wholesome	45
128·0	82·0	46·0	Traces	Excellent	46
128·0	91·0	37·0	Traces	Pure and wholesome	47
1592·5	1517·5	75·0	H. traces	Saline water	48
287·0	198·0	89·0	Sl. traces	Very suspicious	48
236·0	146·0	90·0	Traces	" "	59
167·0	122·0	45·0	Traces	Pure and wholesome	50
80·8	60·8	20·0	Sl. traces	Not contaminated	51
243·2	164·0	79·2	V. H. traces	Probably polluted	52
10319·6	9005·6	1314·0	None	Saline water	53
218·4	172·0	46·4	None	Suspicious	54
386·4	312·0	74·4	None	"	55
159·2	125·6	33·6	V. H. traces	"	56
264·0	213·6	50·4	Sl. traces	"	57
251·2	212·8	38·4	Traces	"	59
265·6	220·8	44·8	V. Sl. traces	"	60
472·8	392·8	80·0	V. H. traces	Seriously polluted	61
1222·4	942·4	280·0	V. Sl. traces	" "	62
347·2	268·8	78·4	Traces	Decidedly suspicious	63
198·8	139·2	59·6	Traces	Contaminated	64

From our own correspondence, and from the attention given in agricultural meetings and by the press, we are convinced that every year marks a more lively interest in this question of pure water upon the farm. There is no doubt that the number of farmers placing the base or source of their supply at a safe distance from possible pollution is steadily on the increase.

Nevertheless, there are still many who exhibit a complete apathy on this vital question, and it is to these we would appeal. If there are reasons to suspect the water —indications of contamination in smell or appearance—they should not be disregarded. It is quite possible that the well is receiving pernicious drainage from barn-yard, stable or privy. Neglect in this matter may mean jeopardizing the health of the farmer and his family, not to speak of troubles of various kinds in the dairy and cheese factory.

A number of the waters received from Manitoba and the North-west Territories, as well as from certain districts in other provinces, have been shown to be strongly saline. In the report of this Division for 1893, the results of certain experiments towards the improvement of saline waters are recorded. It is there shown that when the chief saline constituent is Epsom salts (magnesium sulphate) purification to a large extent may be effected by the judicious use of lime-water. For the preparation of a potable water from those containing sulphate and chloride of sodium (Glauber's salt and common salt) it will be necessary to have recourse to distillation, no method of filtration or precipitation for such waters being practicable. There are now upon the market several small stills that can be used on the kitchen stove and require but little attention. We cannot speak from personal experience of these household stills, but there is no apparent reason why they should not prove effective, yielding at but little, if any, extra expense a sufficiency of good palatable drinking water for the household.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST.

(JAMES FLETCHER, LL.D., F.R.S.C., F.L.S.)

1901.

OTTAWA, December 1, 1901.

DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to hand you, herewith, a report on some of the more important subjects which have received attention in the Division of Entomology and Botany during the year 1901. Many other subjects which have taken up some of the time of my assistants and myself need not be treated of specially in this annual report. The large numbers of applications for information and assistance made to the officers of the Division by agriculturists, horticulturists and others, continue to give encouraging evidence, not only of the usefulness of the investigations which are being carried on year by year, but also of the increasing appreciation of this work by the public in all parts of the Dominion. Of necessity a large proportion of the correspondence relates to the common, and therefore the more important, crop pests, concerning which serviceable advice can be given promptly. In this way much loss in many crops has been avoided.

Correspondence.—The large correspondence of the Division has been of a very varied character. From November 30, 1900, to November 30, 1901, the number of letters, exclusive of circulars, registered as received, is 3,058, and the number despatched 2,840.

Meetings Attended.—Meetings of farmers, dairymen, fruit-growers, &c., have been attended whenever other official duties would allow of my absence from Ottawa. Addresses were delivered at the following places :—

January 21-22, Kingston, Ont.—A meeting at Queen's University to discuss the importance of Forestry to Canada. Addresses were also given by the Hon. R. Harcourt, Minister of Education for Ontario ; Prof. B. E. Fernow, of Cornell University, and others.

January 31, Huntingdon, Que.—Pomological and Fruit Growing Association of the province of Quebec : 1. Injurious insects. 2. Can bees injure fruit ?

February 12, Toronto.—Toronto Horticultural Society : Insect Enemies of the Garden. Toronto Normal School : Nature Study.

March 19, Ottawa.—Select Standing Committee on Agriculture.

April 2, Ottawa.—Ottawa Normal School : Nature Study.

April 18, Smith's Falls, Ont.—Horticultural Society : Injurious Insects. Smith's Falls Public School : Nature Study. Smith's Falls High School : Nature Study in Education.

February 19, Perth, Ont.—Perth Public Schools : The Value of Nature Study and the Pleasures of Horticulture. Perth Horticultural Society : The Importance of Nature Study and Science in Horticulture.

June 6, Vars, Ont.—Public schools and farmers of the district : Nature Study and Science in Farming.

July and August.—Farmers' meetings in the West.

September 13, Buffalo, N.Y.—National Bee-keepers' Association and American Pomological Society : Address on Bees as Fertilizers of Flowers.

October 25, Gypsum, Ohio.—Special meeting of farmers : The San José Scale and the way to fight it.

November 13, London, Ont.—The Entomological Society of Ontario : 1. The Ohio and Ontario Experiments against the San José Scale. 2. The Value of Nature Study in Education. 3. Injurious Insects of 1901.

November 15, Toronto.—Toronto Branch of the Entomological Society of Ontario: The San José Scale in Ontario.

Fodder plants.—The experiments with grasses of all kinds and fodder plants have been continued upon the Central Experimental Farm, and, as in the past, have been a source of much interest to visitors. The summer of 1901 was exceptionally favourable for the growth of all grasses, and the varieties under cultivation succeeded well and made the Experimental Grass Plots a most attractive feature of the farm. In addition to the small plots of one square rod each, larger plots of the more desirable varieties were grown. The Awnless Brome Grass, introduced into Canada by the Experimental Farms in 1887, justly continues to increase in popularity ; it has proved a lucrative crop for seed growers and provides stockmen of the West with a prolific source of grass and hay. McIvor's Rye-grass, or Western Rye-grass (*Agropyrum tenerum,* Vasey), a native of the prairie regions, is also a most valuable grass, and is now much cultivated for its rich and heavy crops of hay and seed. Many packets of seed of these two grasses have been distributed to farmers and have given great satisfaction.

Reclaiming Sand Hills.—As was mentioned in my report for 1898, experiments are being carried on at the request of Dr. T. Christie, M.P., near Lachute, Que., in reclaiming a large tract of shifting sand now nearly 1,000 acres in extent. Among the plants used for this purpose, the White Spruce, Norway Spruce, Balsam Fir, White Pine, willows, Awnless Brome Grass and Quack Grass have been tried. The work as yet has been on too small a scale for marked results. A visit was paid on November 5 to the locality with you and Dr. Christie and an examination made of the area invaded by sand. After the past moist summer many of the trees which have been planted were found to have thrived satisfactorily, but the grasses had not done so well. Judging from the success of these trees, it is sincerely to be hoped that experiments on a more extensive scale may be carried out at an early date. The farmers living on the margin of this area of sand have shown much interest in the reclaiming of the land, have planted trees at considerable individual expense, and have taken good care of such trees as they were provided with.

Collections.—The collections of insects and plants in the Division have been very materially increased during the past year, and great progress has been made in building up a serviceable working collection. Many specimens in all orders of insects have been mounted and placed in the cabinets. Mr. Arthur Gibson, my second assistant, has done much of this work of arrangement and preparation of the specimens. Many larvæ of Lepidoptera and phytophagous Hymenoptera have been inflated and form a most interesting and valuable addition to the collections in those orders. A great many botanical specimens of Canadian plants have been mounted and deposited in the herbarium where they are now available for reference. This work is now being

pushed forward, and during the present winter I hope to have all the collections rendered much more complete than has been heretofore possible. The herbarium is in charge of the Assistant Entomologist and Botanist, Mr. J. A. Guignard. The Division is indebted to several correspondents for valuable donations of specimens. Every specimen in the collection is labelled with the name of the collector, the date when collected and the locality. Large collections of rare specimens have been generously given by the following :—

Rev. G. W. Taylor, Wellington, B.C.—Vancouver Island Lepidoptera and Coleoptera.

Mr. J. W. Cockle, Kaslo, B.C.—Many specimens of moths, butterflies and a few specimens of other orders, taken at Kaslo, on Kootenay lake, also the eggs of Lepidoptera for rearing.

Mr. W. C. Sandercock, Lauder, Man.—Manitoban insects.

Mr. A. J. Dennis, Beulah, Man.—Manitoban moths.

Mr. T. N. Willing, Regina, Assa.—North-west insects of several orders from Assiniboia and Alberta.

Mr. W. McIntosh, St. John, N.B.—Moths and butterflies from St. John.

Mr. F. H. Wolley-Dod, Calgary, Alta.—Some rare butterflies from Alberta.

Mr. N. Criddle, Aweme, Man.—Botanical specimens and paintings of Manitoban plants and insects.

Mr. J. M. Macoun, Ottawa.—A collection of Canadian violets.

Mr. J. R. Anderson, Victoria, B.C.—Many rare British Columbian plants not previously represented in the heibarium.

Mr. John Tolmie, Victoria, B.C.—Rare British Columbian plants.

Mr. Beverley McLaughlin, White Horse, Y.T.—A small collection of rare and well prepared plants from Yukon Territory.

Miss E. Blackman, Kaslo, B.C.—Rare plants from Kaslo, including one species, *Hemieva violacea,* never previously collected in Canada.

Mr. W. Herriott, Galt, Ont.—Specimens of Canadian grasses, many of them not previously represented in the collections.

Mr. Percy J. Shaw, Berwick, N.S.—A collection of Nova Scotia weeds made in Pictou county.

Mr. Henry Bird, Rye, N.Y.—Living caterpillars of *Hydrœcia* moths sent for study.

During the year 1901, as heretofore, many entomologists and botanists in various parts of the Dominion have availed themselves of the services of the officers of the Division in identifying specimens of insects and plants. A large number of collections have been received for this purpose and by means of this work much valuable information as to the distribution of native insects, plants, and weeds of cultivated lands, has been recorded and many desirable specimens have been acquired for the museum.

Acknowledgments.—My thanks are gratefully tendered to the following for frequent and valuable assistance in the identification of specimens : Prof. John Macoun and Mr. W. H. Harrington, Ottawa ; Mr. E. M. Walker, Toronto ; Prof. J. B. Smith, New Brunswick, N.J. ; Dr. Howard and his able assistants, in the United States Division of Entomology ; Mr. W. H. Ashmead, Dr. H. G. Dyar, of the United States National Museum ; Messrs. B. T. Galloway, A. F. Woods and F. H. Chestnut, of Washington, D.C. ; Prof. F. M. Webster, of Wooster, Ohio ; Prof. L. R. Jones, of Burlington, Vermont ; and Mr. G. B. King, of Lawrence, Mass., all of whom are

eminent specialists in certain lines of study. I am also under obligation to my many correspondents who have notified me of outbreaks of injurious insects and assisted in carrying out experiments for controlling the same. Recognizing the great value of this assistance, I endeavour to give proper credit where it is due, when circumstances demand that the various subjects should be treated of at length in the annual reports. All records of observations in letters from correspondents are carefully preserved and made use of, either when received or at some future time. Every exact observation is of scientific value, and frequently small facts apparently of little importance at the time, provide missing links of great importance in working out the life histories of injurious insects and devising remedies for their control.

In conclusion, I have much pleasure in testifying to the assiduity and excellence of the work performed by my assistants, Mr. J. A. Guignard, B.A., and Mr. Arthur Gibson, in office hours or afterwards whenever required.

I have the honour to be, sir,
Your obedient servant,

JAMES FLETCHER,
Entomologist and Botanist.

Central Experimental Farm, Ottawa.

1. Plot of Awnless Brome Grass, Second Year (In centre of plate). 2. Part of Experimental Grass Garden.

NOTES ON LECTURING TOURS AND INVESTIGATIONS

IN MANITOBA, THE NORTH-WEST TERRITORIES AND BRITISH COLUMBIA IN 1901.

By instruction of the Honourable the Minister of Agriculture, and at the request of the several governments of Manitoba, the North-west Territories and British Columbia, I spent the months of July and August last in the West. In Manitoba the chief subject studied was locust injuries. In the North-west Territories a series of farmers meetings was held in northern Alberta in continuation of work of a similar nature which I have taken part in during the last three summers. The special subject for discussion was Noxious Weeds and their Eradication. In this work particular attention has been drawn to the great value of using light harrows and weeders on growing grain crops after they have appeared above the ground, also the value of Nature Study in Agricultural Education. In British Columbia insects injurious to field crops and fruits were dealt with as well as weeds, hay and fodder crops in general, and Nature Study.

MANITOBA.

Leaving Winnipeg on the first of July in company with Mr. Hugh MacKellar, the Deputy Minister of Agriculture of Manitoba, and the Rev. W. A. Burman, I visited certain districts where serious inroads were being made into the crops by grasshoppers. A report on this investigation made to the Hon. R. P. Roblin, Minister of Agriculture for Manitoba, in which the main features of importance are dealt with, appears further on in this report. (See page 222.)

THE NORTH-WEST TERRITORIES.

After finishing the work in Manitoba, I proceeded westward. A most pleasant and profitable day was spent at the Experimental Farm at Indian Head, examining the crops and making other observations connected with my work. The exuberant appearance of all vegetation throughout the West this year surpassed by far anything which had ever been seen before since the settlement of the country, and the magnificent crop which has just been reaped confirms the hopes which were entertained by all classes at the time of my visit. July 10 was spent at Regina with Mr. T. N. Willing, the Territorial Weed Inspector for the North-west Territories, and an interesting drive was taken through the country surrounding the North-west capital, during which notes were taken as to the degree of prevalence of noxious weeds. The good work which has been done by the North-west Government in this connection, was very perceptible.

On the evening of July 10, I left Regina and reached Pense, where I visited Gatesgarth, the home of Messrs. Gerald and Bernard Spring-Rice. This is now a most interesting place, where successful experiments have been carried on for some years in advanced farming and tree-planting. The following day was taken up in examining the groves of trees, plantations of shrubs, fields of Brome Grass and other crops. The greatly enhanced beauty of this place, due to the enthusiasm and skill of the brothers Spring-Rice, the improvements and advanced methods practised, have for several years been an object lesson to the farmers of the district. My kind hosts spared no pains to make my visit profitable and enjoyable. On the evening of July 12, I reached Calgary and joined Mr. Angus Mackay. Leaving Calgary early on the

morning of July 13 with Mr. F. H. Wolley-Dod, I drove out with him to his stock farm 20 miles southward of Calgary, thus obtaining a good opportunity of seeing the crops and the country in this very attractive part of the Territories. On the morning of July 14, Col. Herchmer drove me out to see his farm on the Bow River, close to Calgary, a charming location where he has made many improvements. In the afternoon the Dominion Dairy Station and Cold Storage houses were visited with the Chief Superintendent, Mr. Christian Maerker ; afterwards we went to see Mr. Wm. Pearce and were shown his experiments in growing trees, which he has been carrying on for several years with considerable success. On the morning of July 15, I left Calgary in company with Mr. Angus Mackay and Mr. George Batho, of the Nor'-west Farmer staff, by the Edmonton branch of the Canadian Pacific Railway to hold farmers' meetings along that railway. These meetings, for which arrangements had been made by the Department of Agriculture for the North-west Territories, were held at various places during the following two weeks, and the chief subject treated of by the speakers was the Eradication of Noxious Weeds. At all of these meetings the procedure followed was for Mr. Mackay to deliver the first address, in which he dealt with the chief features of the Experimental Farm work, which would be of interest in the locality, such as the experiments in eradicating weeds on dirty lands, the value of summer-fallowing for various purposes, the cultivation of grasses, the growth of trees and fruits, and the distributions made of trees and seed grain. He also pointed out the many ways in which the farmers of the North-west Territories could avail themselves of the benefits to be derived from the Experimental Farms, and assured them that he would always be pleased to assist them in every way in his power. Mr. Mackay's great knowledge of all branches of farming and his reputation as a reliable source of information on these matters proved a great attraction to the farmers in all the places where meetings were held. My own addresses were intended to explain concisely the nature of weeds in general, the losses due to their presence in crops, and the methods which had been found successful in combating them in various places with similar conditions of soil and climate. Particular attention was paid to those plants which were found to be prevalent in the different localities. Freshly gathered specimens were always collected before the addresses were delivered, which were found most useful in showing exactly what plants were being discussed. Large numbers of specimens were brought to the meetings by farmers wishing for information upon special weeds which they had seen or had found troublesome on their own farms. A few specimens were also taken with us of some of the worst weed enemies, such as Stink Weed, Larkspur, Sweet Grass, Wild Oats, &c., in case these might not yet have been introduced into the various districts, but of which it was most advisable that farmers should know the appearance and nature, so as to guard against them and attend to their destruction promptly, should they by chance be introduced. Mr. Batho placed us under a debt of gratitude by his kindness in collecting specimens and in creating an interest in the meetings in many other ways. The success of several of the meetings was also much enhanced by the presence and energetic help of Mr. T. N. Willing, of Regina, and of Mr. Percy B. Gregson, of Waghorn, Alta., the local Weed Inspector, who had taken great pains to make it known when and where these meetings were to be held.

Olds, July 15.—An excellent meeting, the first of the series, was held at this thriving little town, which is the centre of a rich agricultural district, settled largely by Americans from Nebraska and Germans from Ontario. Mr. Henry Briggs was in the chair, and gave an admirable address on experiments he had been carrying on in growing fall wheat and fodder plants. Awnless Brome Grass he had cultivated for seven years, and he had always found it most satisfactory in every way. White Clover had done well, and Alfalfa was promising. Fall wheat sown early on newly broken ground had succeeded best, but, when this grain was sown on well worked land, the crops were heavier, although they ripened later.

Innisfail, July 16.—Mr. F. M. Oldham in the chair. A well attended meeting. Awnless Brome Grass was a subject much discussed. Mr. Mackay referred to the fact that this grass was not so highly esteemed at Calgary and Pincher Creek as at other places in the Territories. He had found it excellent in every way at Indian Head and considered the hay the best he had grown for horses. The seed could be sown at any time, but he preferred sowing directly after seeding spring grain without a nurse-crop, as there is not enough soil-moisture at Indian Head to support both crops to the best advantage. He attributed some of the failures in the Calgary district to too heavy seeding ; 8 or 10 lbs. of seed per acre was the proper quantity to sow. There was no difficulty in eradicating Brome Grass if the work was done properly. The sod should be broken 2 or 2½ inches deep during hot weather in June and back-set in August. To prevent the blowing away of surface soil, which was a trouble in some parts of the North-west, Brome Grass and Western Rye-grass were of great value. In his experiments he had found that wheat did best on Western Rye-grass sod, and oats and barley on Brome sod. One crop of Brome Grass would provide fibre in the soil for three or four crops of wheat or other grain. An animated discussion was held on the weed question, and Mr. Mackay paid a high tribute to the good farming of Mr. Henry Briggs, whose farm he had visited the previous day and had found to be one of the cleanest farms he had seen in the Territories ; this farm showed what could be done by good work. A large collection of weeds was examined and the characters of each were explained. The value of summer-fallowing for the purpose of clearing land of weeds was pointed out. This should be done early and followed by not more than three or four cultivations so as to allow seedlings time to germinate. It was quite possible to cultivate land so frequently in hot weather that the germination of seeds could not take place, and the land would be left almost as dirty as when the work was begun.

Mr. Gregson compared the condition of farms in the Innisfail district this year and last. He also showed examples of Stink Weed and Canada Thistle collected in the locality and warned farmers against allowing these troublesome pests to spread.

Red Deer, July 17—Mr. A. Cole in the chair. The meeting was small, owing to another important meeting on school matters being held at the same time. Among weeds brought to the meeting by Mr. Gregson were samples of Canada Thistle, four feet high ; Stink Weed, two feet ; Shepherd's Purse, 18 inches ; Larkspur, five feet ; Wormseed Mustard, three feet, and Gray Tansy Mustard, four feet. Red Deer is an older settled district than some others in northern Alberta ; the settlers from Innisfail and Red Deer to Lacombe are chiefly from Ontario.

Strathcona.—This thriving town, formerly known as South Edmonton, was reached on the evening of July 18, which was marked by an unusual phenomenon for the locality, a furious hail storm, which, together with two preceding storms at recent date, had worked great havoc on the crops and all other vegetation. A meeting was held at 2 o'c., of 19th, Mr. McLean in the chair. Mr. McIntyre, the secretary, had worked up the meeting well, but other interests prevented a very large attendance. Mr. Mackay spoke of summer-fallowing, and much interest was evinced in weeds. Farmers were warned against Ball Mustard (*Neslia paniculata,* Desv.), which was the most prevalent weed noticed in grain fields from Calgary to this point. Mr. T. N. Willing spoke of the necessity of farmers in the Edmonton district taking more pains to clear weeds from their crops, particularly from oats. Mr. George Batho exhibited samples of Russian Pig-weed (*Axyris amarantoides,* L.), which was spreading rapidly through the Territories, particularly along lines of railway. It is a bad weed of vigorous growth, with hard wiry stems, which are difficult to cut. In the winter it becomes a tumble weed.

Clover Bar, July 20.—Mr. Daly in the chair. Leaving Strathcona at 10 o'clock, we drove over roads, bad, owing to late rains, to Clover Bar, a very thriving district

where a good meeting was held. The farmers were very hopeful, regarding the recent hail storms as quite exceptional occurrences not likely to happen again. Ball Mustard and annual weeds were much discussed. Mr. Mackay recommended that early summer-fallowing should be practised in connection with mixed farming. Plough deeply, 7 or 8 inches, if possible, before June 1, and at any rate before July 1. Harrow at once and cultivate three or four times, not more. Sow oats or barley for feed the first year, and cultivate, but do not plough again. In the second year sow Red Fife wheat, seeding two weeks after spring opens. If oats are sown, plough once, and sow two weeks later than wheat. Brome and other grasses may also be used as cleaning crops.

Fort Saskatchewan, July 20.—Leaving Clover Bar at 4.30, we drove to the old settlement of Fort Saskatchewan, where a most successful meeting was held the same evening. It was pointed out that many weeds were by far too noticeable in the crops seen along the road. The most noxious of these were shown, and methods for their control were given. Both here and at Clover Bar much inquiry was made about Sweet Grass (*Hierochloa borealis,* L.). The chief cause of its persistence was found to be that settlers had been calling it by the wrong name, viz., 'Twitch grass,' and treating it accordingly. 'Twitch Grass,' or 'Scutch Grass,' is a shallow-rooted perennial requiring shallow ploughing, whereas Sweet Grass roots deeply and requires as deep ploughing as possible, the very opposite treatment to that which it had generally received. In both cases, the land should subsequently be put under a smother crop, such as a thick seeding of oats or barley to be cut for feed as soon as ready. The best time to cut oats for hay is when they are in blossom.

Mr. Mackay again pointed out the value of summer-fallowing as a weed clearing process and advised the practice at least once in three years. Leaving Fort Saskatchewan early on the morning of July 21, we drove in to Edmonton and spent the day there.

Leduc, July 22.—This is a new settlement, peopled for the most part by Americans, Russian Germans and Canadians from Ontario. It rained nearly all day, and, owing to the state of the roads, few farmers could come in to the meeting. An informal meeting was held in the Leland hotel, a nice clean house, kept by Mr. Willis. The afternoon was spent making botanical collections, several interesting specimens being secured.

Wetaskiwin, July 23.—Mr. J. McVicar in the chair. This is a new place, settled mainly by Swedes, Germans and Americans. An enthusiastic meeting was held in the afternoon with a prolonged discussion on summer-fallowing, the best time to sow, and the quantity of seed grain to the acre. Awnless Brome Grass was recommended. Speaking of the value of this hay, Mr. Mackay stated that he had obtained as good results in feeding the straw of this grass, from which the seed had been threshed, as from any other hay. Some difficulty having been experienced in knowing the proper time to cut Brome for seed, it was explained that this should be done when the seed was of about the same consistency as wax. At Indian Head, Brome Grass flowered about July 1, when the fields presented a golden yellow appearance from the copious pollen-bearing anthers; three weeks later than this the seed would be ripe enough to cut and the fields would be of a purplish hue. Cutting should not be delayed too long or much seed would be lost. When the seeds on a few heads would shell out, the crop should be cut. An acre of Brome Grass would give from 400 to 800 pounds of seed and an average of 2½ tons of hay. The crop would depend largely on getting good rains in May. Well cleaned Brome seed would always fetch at the lowest figure 10 cents per pound. Four crops of Brome Grass could be taken from one seeding, but the best management was to take two crops of hay and then use the field as pasture for two years.

Ponoka, July 24.—Mr. Alger in the chair. A large meeting was held here. Ponoka is beautifully situated on the banks of the Battle river with rich rolling land around it, which has been settled by progressive Canadians from the East and Americans. Much interest was taken in the subjects treated of by the speakers. Summer-fallowing early was highly recommended by Mr. Mackay for cleaning land of weeds. It had been noticed that very few of the summer-fallows to the north of this place had been ploughed at the present time, and yet the seeds of many weeds, such as Shepherd's Purse, False-flax, Pepper grass, Stink Weed, where it occurred, and some others were already ripe. It was claimed that summer-fallowing, as advised, in these rich moist lands, would make the crops late and give too much straw. Mr. Mackay advised heavier seeding, viz., 2 bushels of wheat, and 2½ bushels of oats ; this was more seed than was used at Indian Head, where they found that 1½ bushels of wheat and 2 bushels of oats to the acre gave the best results. Great stress was laid on the importance of sowing clean seed as a means of reducing weed presence; Mr. Mackay believed that the success he had secured at Indian Head in keeping their land free of weeds was very largely due to the care taken in cleaning seed grain. Summer-fallowing however, he considered essential if the rich lands of the West were to be kept free of weeds. Lateness of the crop grown on such land and too luxuriant a production of straw might be prevented by the following method. Fallow by ploughing deeply as soon after seeding time as possible, harrow to start the weeds. Three weeks will give the weed seeds near the surface a chance to germinate ; cultivate these 2½ inches deep and repeat the operation 3 times. This will destroy four crops of weeds. Next spring harrow early, leave the land till the 1st of June, then sow a grain crop to be cut for green feed in the first week in August. After cutting this, plough 2½ or 3 inches deep and sow wheat the next spring. If the land is still thought to be too weedy, two crops of grain feed may be taken. If the land is not very weedy drill in wheat 2½ inches deep without cultivation, and, when it is one or two inches high, run over it with a weeder or light harrow. Brome Grass and Western Rye-grass were discussed, and the proper seeding of each of these was stated to be 10 pounds to the acre. Western Rye-grass provides excellent pasture and hay, but the latter must be cut when in bloom ; the straw from which ripe seed has been threshed, is almost useless. The difference between Awnless Brome (*Bromus inermis,* L.) and the native Western Brome (*Bromus Pumpellianus,* Scrib), was explained to be that, of the former, the stems and leaves are perfectly smooth and the chaff scales bear no spike-like awns, while in the native species, which is also a luxuriant and very valuable grass, the leaves and stems, particularly at the joints, are always more or less hairy and the chaff bears a short sharp awn.

Earnest inquiries were made as to whether plums and apples would be likely to succeed in the district, and mention was made of the successful experiments which have been carried out at the Experimental Farms in selecting desirable forms of the native plum and in improving the hardy Siberian crab apple (*Pyrus baccata,* L.) by crossing it with the best varieties of hardy apples. Some fall wheat which would have been ripe in about two weeks, was shown at this meeting, and Mr. George Batho spoke of the success in growing this grain in the district.

Lacombe, July 25.—Mr. F. B. Watson in the chair. A splendid meeting was held at this thriving and active town. The meeting had been well worked up by Mr. Percy Gregson, and the farmers brought in a large number of specimens of weeds and other plants concerning which they desired information. Col. J. J. Gregory contributed many plants of interest and took a leading part in the discussions, bringing forward many subjects which he knew to be of special interest in the locality. After the meeting broke up, it was carried on informally for nearly another hour by those present who wished to make the most of the opportunity to discuss various farming matters with the speakers. Mr. Gregson spoke at length of the efforts being made by the Hon. G. H. V. Bulyea to help the farmers of the North-west in their fight against

noxious weeds and of the excellent work which had been done by Mr. T. N. Willing, the Territorial Weed Inspector. Specimens of Stink Weed, Canada Thistle, Ball Mustard, Wild Mustard, and Bird Rape (or Smooth Mustard) were exhibited.

During the evening a visit was paid to Mr. Howell's beautiful garden, where everything was growing in the greatest luxuriance.

On the morning of July 26, we drove out to see Col. Gregory's farm, and particularly a good patch of Alsike clover. Here we found many things of interest—a fine patch of Brome Grass, grown from a small sample of seed sent from Ottawa three years previously ; a field of spelt wheat, very fine turnips and a nice grove of native trees, spruce, aspen and birch, which have grown remarkably well in the seven years since they were planted, also two kinds of native currants (*Ribes Hudsonianum,* Rich., and *Ribes floridum,* L'Hér.).

Leaving Lacombe at noon, we reached Calgary at 7 p.m., and I left the same night for British Columbia to examine some of the districts which were last year devastated by the Variegated Cutworm, and to hold meetings with Mr. J. R. Anderson at several places where Farmers' Institutes had been formed.

British Columbia.

I reached Revelstoke at 2.30 p.m., July 27, and Nelson at 7.30 on 28th idem. A night and part of the following day were spent at this picturesquely situated little town on the shore of Kootenay Lake, and at 4 o'clock in the afternoon I took the steamer *Kokanee* for Kaslo, which place I reached in the evening. I was met there by Mr. J. W. Cockle, an enthusiastic naturalist, who has been of great assistance to me by collecting insects and plants and by sending information concerning injurious insects. Before dark, I was able to call and see Mr. George Alexander, a great lover of flowers, and to go over his most beautiful flower garden. I had heard previously of Mr. Alexander's success in floriculture, but was little prepared for the blaze of colour and the large number of choice plants which were to be seen in his grounds. After passing the night with Mr. Cockle, and examining his extensive collection of insects, he kindly took me to visit several gardens in the upper town, where heavy crops of all kinds of fruit were seen. While at Kaslo, I had the pleasure of meeting Miss Ethel Blackman, a botanist, who has contributed many rare and highly valued specimens of plants to the herbarium of the Division. I left Kaslo at 10 o'clock, July 30, and took the train to Sandon. The scenery up this railway to Sandon and down again to Nakusp on the Arrow Lakes, is extremely grand. After a delightful trip by boat up the Arrow Lakes to Arrowhead, the train was again taken and the night passed at Revelstoke. Vancouver was reached during the night of July 31, and I proceeded the next day to Nanaimo.

A series of meetings of Farmers' Institutes was held during the month of August at various places on Vancouver Island, in the Fraser valley, the Nicola valley, and in the Okanagan valley. These meetings were arranged and all were attended by Mr. J. R. Anderson, the active Deputy Minister of Agriculture for British Columbia, who also ably fills the difficult post of Superintendent of Farmers' Institutes for the whole province. The Farmers' Institute is a much newer development in British Columbia than in the older provinces, and many districts have not yet organized themselves into institutes. Where, however, organization has been effected, the members appreciate very fully the advantages to be derived from the system. Farmers come to the meetings knowing what they want, and are prepared to put their views plainly before the meeting and get the opinion of others upon subjects of general interest. The province has a most useful and painstaking officer in the Deputy Minister, who makes a point of attending officially all meetings whenever possible, and the farmers in that way have frequent opportunities of bringing their wishes directly before an executive officer of the Government. The Central Farmers' Institute is firmly established, and the annual meeting is well attended by delegates from all parts of the

province. This meeting is held in the autumn. Ever since the establishment of the institutes, special speakers have been provided by the provincial Government to address the meetings upon agricultural subjects at each place at least once or twice a year. In this way, the farmers of the Pacific province have had an opportunity of hearing some of the best institute workers of the East. Among others, series of several meetings have been held during the last four years, by Messrs. Shutt, Gilbert, Robertson, Hodson, Stewart, Maerker, Ruddick, Drummond, Raynor, &c.

Comox, August 2.—The first meeting was held at Courtney, near that place. There are few spots better suited to dairying than this. Most luxuriant crops of hay and other fodders are grown, and the pastures are excellent. A butter factory has been lately established, and is doing well. Fruit is also grown to advantage.

The meeting was well attended and an animated discussion took place. After the meeting we drove to Union Mines. The following day was spent in the Beaufort range of mountains, collecting botanical and entomological specimens. Mr. Walter Anderson accompanied us on this trip and discovered a species of *Rubus* (*R. nivalis* of Howell's Flora), new to Canada. Leaving Union early August 4, a most delightful drive of 42 miles through the forest was taken to Parksville, where we were most hospitably welcomed and entertained by Mr. and Mrs. R. F. Hickey. Mrs. Hickey had collected several injurious insects, amongst which I found a few specimens of the Variegated Cutworm. We left Parksville on the morning of August 5, and drove 35 miles to Alberni, passing along the beautiful Cameron Lake and through the wonderful forest at the base of Mount Arrowsmith. We arrived at our destination at 5 o'clock.

Alberni has an active institute, and a good meeting was held at 8 o'clock the same evening. Great interest was evinced in the proposed action of the Department to assist farmers in the very heavy and expensive work of clearing away the stumps of the gigantic trees which are characteristic of that part of Vancouver Island. It was announced by Mr. Anderson that his Minister had made arrangements by which gunpowder of the most suitable kind would be provided at half the price they could get it themselves, if they would conform to certain conditions. There was an animated discussion on the weeds of hay lands and pastures. My own address was on the great importance of the new educational movement known as Nature Study, which I claimed must be of inestimable value to farmers ; in fact, I consider Nature Study is the common sense of education, whatever may be the chosen vocation of any schoolboy or girl, and this is more particularly true of farmers, for all their work has to deal directly with objects, a knowledge of which comes within the limits of natural history. Successful farmers are those who understand their business best. The farmer who knows how plants grow, feed, and develop, will best understand how to fight weeds, which crops are suitable for certain soils, the way to treat them, their requirements, and how they can be used to his own greatest advantage. A knowledge of zoology would be of great use to a farmer in caring for and breeding stock. With even an elementary knowledge of entomology, he could cope much better than the farmer of to-day with the many insect enemies which yearly destroy a large proportion of every crop. To illustrate this, I referred to Mr. Anderson's good work at the beginning of the cutworm outbreak last year, and showed that much loss had been avoided by his being able to advise promptly what should be done to check the caterpillars in their depredations.

The benefit of cultivating clovers and other nitrogen-gathering crops was explained, the best time to cut hay, and the advantage of a proper rotation of crops. Speaking of the great interest now being created in forestry by the new Canadian Forestry Association, I urged my hearers to do everything in their power to preserve the magnificent forest around Cameron Lake, within a few miles of Alberni, which I had driven through when coming to the meeting, and which I believe is one of the finest pieces of standing timber in the world. The very size of the trees, as up to the present there are no railways there, would protect it for many years if they could only keep

out the greatest enemy of all—fire. There were few places where trees of from five to eight feet in diameter could be seen, as was the case there, by thousands. Everyone could do something to create an interest in this subject, if not, indeed, on occasion, to prevent fire from spreading. They were reminded that a single spark was enough to start a disastrous conflagration.

Starting at 5 a.m. on August 6, the ascent of Mount Arrowsmith, the highest mountain in that part of Vancouver Island, was begun. This expedition to the summit of this mountain was of great interest, and large collections of rare botanical and entomological specimens were made, as well as notes taken on the trees and other indigenous plants observed. At a height of about 4,000 feet grand groves of the Yellow Cypress (*Cupressus Nutkaensis,* Hook.) were found. Perhaps the most interesting plants collected were *Allium Nevii,* Wat., a pretty dwarf pink-flowered onion, a blue-flowered caulescent violet and *Calandrinia Columbiana,* Howell, a beautiful plant of the Purslane family, with large fleshy roots and showy pink flowers. The descent of the mountain was made on the afternoon of August 8, and a long drive of 55 miles taken the next day to Nanaimo.

Nanaimo, August 9.—A good meeting was held in this town at 8 o'clock in the evening, where, although the attendance was small, much interest was taken in the subjects presented. The discussion was upon the best crops to grow upon certain soils and on agricultural methods suitable for Vancouver Island. Grasses for hay and pastures were also discussed, and the disappearance of the Variegated Cutworm was much commented upon. Nanaimo was almost the only place in the province where any injury was done by this caterpillar in 1901. Leaving Nanaimo by train the next morning, Victoria was reached at 12.30.

Saanich, August 10.—A largely attended meeting was held at this place. By request, the subject presented was Nature Study in education and as affecting agriculture. Nature Study had recently been added to the regular curriculum of the public schools of the province. Many of the audience, including the leading school teachers from Victoria and the district, went out to the meeting by special train provided for the purpose. There was also a large attendance of farmers who joined heartily in the discussions.

The next day was spent in Victoria, and I had the honour of being shown some interesting experiments in tree culture by His Honour the Lieutenant Governor Sir Henri Joly de Lotbinière in his grounds near Government House.

On August 12, in the morning, I visited Cloverdale, the residence of Mr. John Tolmie, and spent a few hours examining his botanical collections, and interesting plants, which he has growing in his grounds. The afternoon was spent in the small but exceedingly well arranged and instructive museum of the Department of Agriculture. The herbarium, representing the flora of the province, made almost wholly by Mr. Anderson himself, is very complete and several other collections illustrative of the natural wealth of the province are here presented in such a way as to strike the mind of a visitor at once with the capabilities of the country. Among other things may be mentioned that at one end of a room stands a single mounted leaf of the bracken nine feet high. Above this along the ceiling is a single annual shoot of a bramble 12 feet long, and by the side of these a one-year's growth of a young plum tree 8 feet long.

Leaving Victoria by steamer at midnight, we reached Vancouver at 9 o'clock on the morning of August 13. Here I was met by Mr. Tom Wilson, the Government Superintendent of Fumigation, and I went with him and inspected the fumigating house where all imported nursery stock is fumigated for the destruction of the San José Scale, and found everything in perfect order. We left Vancouver at 1 o'clock by the Canadian Pacific Railway, and, proceeding to Harrison, crossed by steam ferry to Chilliwack.

Chilliwack, August 13.—The farmers of this fertile district always turn out in large numbers, and the last meeting was no exception. Insects injurious to fruit

crops were dealt with, and particular reference was made to the disastrous outbreak of the Variegated Cutworm in 1900. The farmers of the whole province are to be congratulated on the activity of the Department of Agriculture, and the prompt manner in which the best-known remedy, the bran and Paris green mash, had been brought before the country through the public press by the Deputy Minister. A tribute was paid to the agricultural and daily press for the way in which they always published at once any matter likely to be helpful to farmers, recognizing that anything which affected the prosperity of the farmer affected that of the whole community.

On August 14, we started on a collecting trip up Mount Ché-am. Driving 12 miles to Popcum, we called on Mr. Eb. Knight, who helped us very much in getting suitable guides, and by 9 o'clock we started on the ascent of this interesting mountain, which, rising from the level of the river 30 feet above sea level, runs up to a height of about 8,000 feet, and presents exceptional advantages for examining the fauna and flora of the various altitudes. The weather was magnificent, and large collections were made during the ascent. By 6.30 an extensive plateau at about 7,000 feet was reached, and camp was made for the night. This plateau is an undulating meadow stretching from where we came on to it for about a mile to a deep valley out of which Angel Peak or Mount Ché-am proper rises to the north, and Lady Mountain, flanked by Deer Ridge, to the south. This mountain meadow is one extended garden of exquisite beauty with the greatest variety of mountain flowers. Covering almost the whole surface of this elevated upland are dwarf bushes of the Mountain Blueberry (*Vaccinium Myrtillus*), not more than a few inches high in many places, but crowded with pink bells ; here and there are large beds of crimson, green, and white Mountain Heather (*Bryanthus empetriformis, B. glanduliflorus* and *Cassiope Mertensiana*), of Purple Lupins (*Lupinus Nootkatensis*), Golden Groundsels (*Senecio aureus* and *S. canus*), Arnicas (*A. latifolia,* and *A. cordifolia*), white-flowered Valerians (*Valeriana Sitchensis*). There again tall wand-like spikes of *Veratrum viride* with handsome broad leaves and green flowers, standing up in a sea of waving grasses and sedges, dotted with the bright starry flowers of Mountain Fleabane (*Erigeron salsuginosus*), their delicate purplish flowers contrasting beautifully with dwarf Goldenrods (*Solidago multiradiata,* var. *scopulorum*), Potentillas (*P. fruticosa*), White-flowered *Spiræa pectinata* and blue-tinged Pentstemons (*P. confertus,* var. *cæruleo-purpureus*), with in some places the gorgeous scarlet tufts of a Castilleja and numberless golden-flowered Glacier-lilies (*Erythronium grandiflorum*). In low spots along streams of snow water, beds of bright yellow buttercups (*Ranunculus Eschscholtzii*), starry white flowers of *Caltha leptosepala* and the crimson spikes of the handsome mountain musk (*Mimulus Lewisii*) were seen. On flats wet with snow water, the delicate white flowers of *Claytonia sessilifolia* covered the ground in company with the bright yellow-flowered *Potentilla gelida.* In a boggy spot with a stream running through it were stiff tufts of mountain coltsfoot (*Petasites frigida*) and the delicate little *Mimulus luteus,* var. *alpinus,* with its hair-like stems and small leaves bearing very little resemblance to the typical species, pushed its large flowers above the icy cold saturated moss. On the upper slopes grew clumps of the silvery *Luina hypoleuca,* the delicate mountain Hare-bell (*Campanula rotundifolia,* var. *alpina*) with its large blue flowers, *Aplopappus Lyallii* with blossoms of a bright orange, and *Troximon aurantiacum* of a variety with purple flowers. Higher up towards the peak *Phlox Douglasii, Pentstemon Menziesii,* and *Silene acaulis* were abundant, and, highest of all, *Smelowskia calycina.* The trees and shrubs most abundant on the upper levels were gnarled and stunted trees of *Tsuga Pattoniana* and an *Abies* like *grandis.* Both of these trees, however, when in protected valleys, even up near the summit between Angel Mountain and Lady Mountain, grew to great size, several trees being over three feet in diameter. Among the most noticeable shrubs were *Pyrus sambucifolia* with pink-tinged flowers, *Rhododendron albiflorum* with its delicate green tinted white bells, *Ribes laxiflorum* and dwarf mountain willows, *Salix commutata,* with handsome foliage, and perfect fruiting bushes of the minute *Salix nivalis,*

not rising an inch above the surface of the ground. It was remarkable that not a single strawberry plant was found on this mountain, although they are plentiful on the Vancouver Island mountains. Insect life was equally abundant with the vegetation. This sea of flowers was visited by swarms of mountain butterflies, *Melitæa anicia,* Db.-Hew., *Argynnis chariclea,* Schneid., *Lycæna aquilo,* Bdv., and *L. anna,* Edw., with *Parnassius clodius,* Men., in the valleys. The most interesting species found on Mount Ché-am is *Erebia vidleri,* Elwes, a species discovered in British Columbia 30 years ago by Captain Vidler, but of which nothing was known as to locality and date of capture. No other locality as yet is known than this mountain where I rediscovered it in 1898, and took three specimens in August. This year I took 13 on August 15 and Messrs. Tom Wilson and A. Bush took as many more. Large collections were made of insects in various other orders, which were brought back safely to Ottawa. We descended the mountain on August 16, and left on the 17th for the upper country, reaching Kamloops early on the morning of the 18th. On the 19th we drove 62 miles down the Nicola valley to Nicola Lake. On the way grass on the ranges, trees in coulees and crops at several places were found to be considerably injured by grasshoppers, mainly a species much resembling the Rocky Mountain Locust (*Melanoplus spretus*), and identified by Mr. E. M. Walker as *M. affinis.*

Nicola Lake, August 19.—A good meeting was held at this pretty little town. Injurious insects, locusts, cutworms, and fruit pests were the subjects of the address, and also Nature Study and the Value of Farmers' Institutes. Leaving Nicola Lake early on the 20th, before the sun got too hot for comfortable driving, we took breakfast at Mr. O'Rourke's hotel, Quilchena, and reached Kamloops by 7 p.m. We left again at 3 a.m. by rail, reaching Sicamous by 6 o'clock on August 21 and Enderby by 9 o'clock. The day was spent in collecting and packing our specimens.

Enderby, August 21.—The first meeting in the rich Okanagan valley was held at this place and was an excellent meeting. Grain crops, Brome Grass, and Injurious Insects were fully discussed, and many inquiries were made concerning weeds. Wild Oats are very prevalent in this valley. After the meeting several farmers waited and an informal discussion, which brought out many useful points, was continued for another hour. Leaving Enderby at 9 o'clock on August 22, the next stop was made at Armstrong, where I had the pleasure of examining Mrs. Walton's collection of insects, and then Mr. Walton kindly drove me to Vernon.

Vernon, August 22.—A meeting was held in the town hall in the afternoon, which was well attended. Fruit, grain and fodder crops were discussed, as well as their insect enemies. Rattlesnakes, which are not uncommon in the locality, were also a subject of debate. It was thought that the virulence of the poison of the variety occurring in this valley was not as great as that of those farther to the south. The Awnless Brome Grass had not succeeded as well here as it had in some other parts of British Columbia and in the Prairie Provinces.

After the meeting a visit was paid to Lord Aberdeen's ranch at Coldstream, where the capabilities of this fertile district are plainly visible. Good management and horticultural skill have combined to make this a model of what a successful fruit farm can be in this district.

Leaving Vernon on the morning of the next day, we took the steamer *Aberdeen* to Kelowna, reaching that place by 3.30. The afternoon was spent in collecting along the shores of Lake Okanagan and in the woods.

Kelowna, August 23.—This was the old Okanagan Mission, but the enterprise and activity of the members of the Kelowna Shippers' Union have made a new place of it. Here fruit of the best quality is produced in larger quantities every year, and every boat that leaves the wharf carries a freight of delicious fruit to less favoured localities. The suitability of the soil to produce an excellent quality of cigar tobacco is now well known, and a thriving cigar factory has been established, with expert makers of home-made and home-grown cigars, which are gaining favour daily over the whole Domin-

ion. The meeting was largely attended, and an interesting discussion took place on plant diseases and the weeds of the farm. Specimens were shown of the Leaf Spot of the tobacco, of diseased potatoes, and of Poverty Weed. The last named is a deep-rooted perennial, a native of alkaline lands, and a most difficult enemy to eradicate.

These meetings in British Columbia were satisfactory throughout, and the wish was frequently expressed that the speakers would soon return to hold similar meetings.

On the way home, stops were made for one day at Glacier and two days at Banff; at both of these places we were favoured with magnificent weather and consequently large collections were made both of plants and insects. From Nepigon, Calgary, Mount Arrowsmith, Mount Ché-am, Glacier and Banff, parcels of living roots were despatched for cultivation in the botanic garden at the Central Experimental Farm.

Ottawa was reached at 5.30 a.m. on the first of September.

I beg gratefully to acknowledge the courtesy of the Superintendent of the western Division of the Canadian Pacific Railway, who gave me free transportation over all parts of the C.P.R. system during the above investigations.

DIVISION OF ENTOMOLOGY.

CEREALS.

The cereal crops of the Dominion this year made on the whole a good showing. Throughout the West the crop of all small grains, with the exception of oats, is unprecedentedly large and of good quality. The conditions in Manitoba and Assiniboia were far more favourable from the beginning than in 1900. The spring opened with fine weather, and there was little rain until the end of May. All farm work was therefore pushed forward. The ground was well charged with moisture from the rains of the previous autumn, and crops got a good start. In Alberta the weather was wetter, colder and more backward throughout the season than in Manitoba, Assiniboia and Saskatchewan, but throughout the Prairie Provinces the summer was showery, and magnificent crops were produced. In Alberta the excessive rain in spring caused some inconvenience by delaying seeding and haying. August was very fine and all crops rushed forward to maturity with remarkable rapidity so that, although harvest began in Manitoba about the usual date, August 18-20, it was only a week or ten days later in Alberta. The latter half of September was cold and wet with snow throughout the prairie region on the 22nd and 23rd. After this the weather turned very fine, crops picked up well, and all work was pushed rapidly forward. The average yields per acre of the more important cereals are as follows: From the Manitoba December Crop Bulletin, a publication of great accuracy:—Wheat, 25·1 bushels per acre; barley, 34·2; oats, 40·3; rye, 23; peas, 18·6; flax, 12·7.

Mr. George Batho, of Winnipeg, has kindly supplied me with the following concerning the North-west Territories:—

'The yields in Assiniboia, Saskatchewan and Alberta were heavier than in Manitoba this year. Probably the most satisfactory crops were at Indian Head, Regina, Moose Jaw and other points in eastern Assiniboia. Throughout this district wheat must have averaged 33 bushels, and many kinds gave returns of 40 bushels. In Alberta a considerable amount of the crop was uncut when cold wet weather came in September; this kept the yields from being as high as was at one time hoped for.

'The oat crop throughout the whole Territories was particularly good. The average for Assiniboia, Saskatchewan and Alberta can safely be put at from 55 to 60 bushels per acre. Some damage to oats, and in a smaller degree to wheat, was wrought by cutworms in Manitoba and in a few localities in the Territories. Grasshoppers also reappeared in the same localities as last year in Manitoba, and where not attended to destroyed a few hundred acres of wheat; but their ravages affected very little the

grand crop of the whole province, and the farmers now know the habits of these insects and have learnt the best ways of fighting them.'

As to the eastern provinces, a general statement applies to all. The crops were good, with the exception of fall wheat in western Ontario, which was badly attacked by the Hessian Fly. The spring opened early with very favourable conditions for growth up to the beginning of July, when there was a period of excessive heat, followed in some parts of Ontario and Quebec, and in the whole of the Maritime Provinces, by a month or six weeks of drought, from which grain crops, hay and pastures, suffered in many places. Some injury was also done to barley and spring wheat by the Hessian Fly and drought. Cutworms in wheat were complained of in the Ottawa valley. One report, the first record of the occurrence of the Wheat Midge in the Prairie Provinces, comes from central Manitoba ; no specimens were forwarded, but the observer, Mr. N. Criddle, is careful and describes the attack accurately, as small light reddish maggots tapering towards the head and clustered around the grains inside the chaff. The Grain Aphis was unusually destructive in several localities in the North-west Territories.

The pea and bean crops in Ontario have been short and low in quality, due chiefly to hot weather. Peas have been much attacked by the Pea Weevil, and many farmers, as a consequence, are turning their attention to the Grass Pea or Chickling Vetch (*Lathyrus sativus*, L.), which gives good crops of 10 to 30 bushels of seed per acre, suitable for nearly all purposes for which peas are used and also perfectly free from the attacks of the Pea Weevil. In Nova Scotia the Black Bean Aphis, or 'Black Dolphin,' has attacked Broad Beans and Horse Beans, so severely in some places as to ruin the crop.

The PEA MOTH (*Semasia nigricana*, Steph.) occurred in some places, but not to the same extent as is frequently the case. At Ottawa there were so few of the caterpillars in cultivated peas that some experiments in spraying the plants with arsenites were rendered useless because neither the treated rows nor those left unsprayed as checks, showed any infestation. A plot of the Beach Pea (*Lathyrus maritimus*, Bigelow), however, was badly infested by this insect or an allied species which worked in the same manner and destroyed nearly half the seeds.

The DESTRUCTIVE PEA APHIS (*Nectarophora destructor*, Jnsn.), which was a most destructive enemy throughout Canada east of the prairie region during 1899 and 1900, and also attacked the clover to a less degree, has almost entirely disappeared ; only a single report of its presence was received. This was from the Island of Orleans, in the province of Quebec. Inquiry from correspondents at several places where it was abundant and destructive in 1899 or 1900, revealed that it had disappeared as suddenly as it had come.

THE GRAIN APHIS (*Siphonophora avenæ*, Fab.).—The plant-lice so often seen upon wheat, oats and rye are well known to farmers. They sometimes occur in vast numbers, but generally disappear suddenly just as the grain is beginning to change colour, as a rule, being destroyed by their many parasitic and predaceous enemies. It is very seldom, however, in Canada, except in restricted areas, that these insects do much harm to the crops attacked. The Grain Aphis multiplies with great rapidity and the insects may be found of varying colours—green, yellow, reddish, or blackish—and of all sizes, on the plants at the same time, on the stems and heads in June and on the leaves in the autumn. These plant-lice in shape are of much the same appearance, but there are frequently more species than one present. Unfortunately there are no practical artificial remedies against grain plant-lice which can be applied on a large scale to fields of grain.

During the past summer there have been rather more important injuries by this insect than usual in the West—three or four slight attacks in Manitoba and two bad ones in the Territories. It is important, however, to state that these outbreaks are, as a general thing, put a stop to by natural enemies. Amongst these some of the most

efficient are small active parasitic insects of the hymenopterous genus *Aphidius*, which fly about among the colonies of slow moving plant-lice and lay their eggs in them. These hatch and the grubs feed inside their victims and destroy them. Infested plant-lice become swollen and hard, and subsequently the parasites emerge through a round hole on the back, or, others of the genus *Praon* coming out beneath the body, spin their cushion-shaped cocoons by which the dead plant-lice remain attached to the plant. In addition to these, several kinds of lady-bird beetles destroy vast numbers, both as perfect beetles and when in the dark-coloured crocodile-like larval form. These lady-bird beetles are oval in shape, flat beneath, and on their red or yellowish rounded backs bear two or more black spots. These well known beneficial insects are so frequently misjudged in their friendly relations with farmers that it seems well to give the above brief description, and again to mention that they are almost invariably friends and should not be destroyed.

The tapering slug-like larvæ of the *Syrphus* or Hovering Flies, about half an inch in length, are also invariably present where there are plant-lice and destroy enormous numbers of them.

'Regina, Assa., August 22.—I send you by this post samples of grain and insects on wheat. On the farm of Mr. Bell, of Davin, green insects have appeared. When I heard of this I drove to his farm. He showed me how the insects had emeralded the canvas of his binder, but, when we went to the fields, the insects were gone. He showed me how they had done damage, and we got a few of the insects which I send.'—N. F. Davin.

'Hicksvale, Assa., August 23.—I am sending you a few heads of wheat inclosed in an envelope with a green insect on them. You can see by the berry how they have affected the grain. It is something terrible the mischief they have done in my wheat fields. They are also on some of my neighbours' wheat. Please let me know what the name of the insect is and if any remedy is known, should it attack my wheat another year.'—J. J. W. Bell.

'Hicksvale, Assa., September 4.—I am sending you a parcel of wheat heads in a large envelope. As you will see, some of the heads are perfect, while others are very poor, with some good berries on the heads. There is a very small insect ; if you will take the bunch of heads and strike them on a white paper a few times, you will find plenty of the insects. I secured some of these by spreading some paste on paper and sticking them on it, which I will inclose in this letter, also some bugs which seem to me to be hunting for and eating the insect. No. 1 is the small insect which you will find on wheat heads. No. 2 is the bug which appears to be eating No. 1. No. 3 is another insect which has infested my wheat fields, also my neighbours', and destroyed hundreds of acres. I may say that there is a lot of wheat which was attacked by No. 3 that is not worth cutting, and is not being cut. I have in patches about 30 acres, I think, which I am not going to cut. Please let me know as early as possible what these insects are and how they affect the wheat.'—J. J. W. Bell.

The insects sent by Mr. Bell were : No. 1, a *Phlœothrips* of an undescribed species, the characteristic marks of the presence of which were very apparent on the green chaff of the wheat heads sent. No. 2, the Thirteen-spotted Ladybird (*Hippodamia 13-punctata*, L.), a persistent and always abundant enemy of plant-lice in the West. No. 3, the Grain Aphis, which had evidently injured the grain to a serious extent.

'Hicksvale, Assa., October 15.—Yours of the 11th September to hand in due time. I examined the standing wheat and could not find any of the insects which you call a *Thrips*, but I should think, if they had been on it, that they would have left it, as it was dead ripe and no substance in it for them to feed on. You seem to doubt that the grain was injured by the insect you call the Grain Aphis. To let you know how thick they were, the first day I was cutting wheat, there was a strip of grain only a few rods wide in the piece infested by them, and before night my binder canvas was coloured

green, a good deep green, where the heads of wheat fell on them, and on the decks these insects were creeping around almost as thick as they could. I did not cut any more wheat for about four or five days, and then the majority of them were gone. Would burning the stubble be of any benefit? Quite a few farmers in this section have had their wheat destroyed in the same way as mine, and some of them think it is frosted, but, instead of being blackened like frosted wheat, it is a very light colour like fall wheat.'—J. J. W. BELL.

'Pincher Creek, Alta.—Kindly inform me what kind of a creature is inclosed in box herewith. It is found in large masses on the binder after cutting a field of oats sowed on new breaking this spring.'—A. E. COX.

WHEAT-STEM MAGGOT (*Meromyza americana*, Fitch).—The fly of the Wheat-stem Maggot is a very common insect all across the prairies, and more or less of the conspicuous 'white heads' due to the attacks of the maggots may nearly always be seen in any field of wheat. In the enormous crops of the past season these attacks were seldom noticed by wheat growers, but a few farmers sent in specimens or injured stems with inquiries as to the cause. Some of them were from Pilot Mound, in Manitoba, and from Whitewood, Indian Head, Grenfell and Sumner, in the North-west Territories.

THE HESSIAN FLY
(*Cecidomyia destructor*, Say).

The ravages of the Hessian Fly in the fall wheat crop of Ontario, sown in 1900 and the spring wheat of 1901, have been more extensive than for many years. Barley has also suffered seriously in a few places reported from, as well as doubtless in many others from which no reports have been received. In a bulletin issued in August last by Prof. Wm. Lochhead, of the Ontario Agricultural College—one of the most complete, concise and useful bulletins upon an entomological subject which has ever appeared in Canada—the total loss caused by the Hessian Fly in the province of Ontario in 1901 will not, it is stated, fall below $2,500,000. This estimate, I believe, is placed too low, as recent reports show that the infestation of spring wheat was much wider spread than was known at the time the above statement was written. In the Ontario Crop Report for November, 1901, the fall wheat crop is stated to be 'a good deal below the average from various causes. In the western counties the ravages of the Hessian Fly were great and much of the surviving grain was light in weight on account of the extreme heat and drought of June and July. Reports from the eastern section—which is free from the Hessian Fly—are somewhat more favourable, especially as regards the Ottawa valley, and East Midland counties, where the crop was a fair one, the principal causes of injury being the excessive early rains and the drought before harvest, owing to which much of the grain is shrunken.' Although in the main the above statement as to the Ottawa valley is correct, all crops of the small amount of fall wheat which is grown in the Ottawa district, were not altogether free from the Hessian Fly, and spring wheat was very badly attacked in some places. Some varieties on the experimental plots at the Central Experimental Farm were injured to the amount of 40 per cent. No mention of Hessian Fly was made this year by correspondents in the Maritime Provinces, and very few reports of injury have been received from Manitoba where it was so very destructive in 1899.

Fig. 1.—The Hessian Fly—enlarged and natural size.

Among a large number of correspondents who have favoured me with reports upon their observations on the Hessian Fly during the past season, I am under special obligation to Mr. John C. Wallis, of Manor Farm, Ferguson (Middlesex Co.), Ont., who has kept me well posted throughout the season on the condition of the infestation. The following is a résumé of his observations which are tolerably representative of the conditions in the south-western counties of Ontario where much fall wheat is grown.

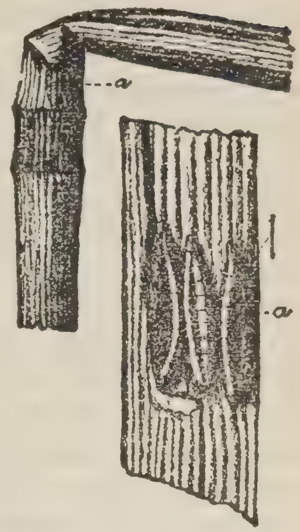


Fig. 2.—Hessian Fly: injured wheat-stem; three puparia—enlarged.

'December, 1900.—Wheat plants full of fly.

'January, 1901.—A mild month. Hessian Fly still to be found in plants above the ground.

'February.—A furious winter month. Heavy snow and plants well covered.

'March.—Similar to February.

'April.—Open and mild, with a very cold and dry parching east winds, which have completely killed all injured wheat plants.

'May 1.—Have had several wet days, but it is now dry. A conspicuous absence of fly, with thinned prospects for wheat.

'May 6.—Upon the snow going away, I made close examination and found some of the flax-seeds. I have just put the twin ploughs on some 9 acres and turned it under. There was an absence of winter-killed wheat, except of the injured plants. The fly has worked my fields and my neighbour's to the extent of cutting out four-fifths of the wheat, and, as the land is very strong, it would grow weeds, so we have sown barley. Of course, I am quite alive to the danger of the fly getting into that. Many farmers are drilling barley across the fields with the hope of getting a mixed crop, and, if the fly should take it, we can plough it down for manure.

'June 1.—Since the beginning of May the weather has been continuously cold and damp; the fly has made great headway.

'June 16.—Inclosed you will find a few specimens of the work of the Hessian Fly. As before stated, I found one stalk infested by no less than 55 flax-seeds. I have commonly been informed of 15 to 40. There are farmers now ploughing up their fields. There is but one outcome, namely, a suspension of wheat culture for a period, unless something unforeseen intervenes to rid us of the pest. I have made a minute examination of the growing barley, and at the time of writing have found no sign of the fly in it, nor in the rye. I notice that Prof. Lochhead recommends late sowing, but this, I believe, is no great safeguard. Late sowing renders the plants so much weaker that the fly seems to be all the more at home in their tender, juicy state.

'August 31.—I mentioned to you that I had sowed barley where I had ploughed down deeply my wheat, which was killed by Hessian Fly. This barley came along royally until it began to make the second and third leaves, when it turned yellow. Upon examination, I found it thoroughly infested. This was ploughed twice, and the land being mellow and rich, I am going to seed it down again with Red Poole wheat, so as to get it seeded out. On this piece I am going to depart from my early and late practice and shall sow from September 10 to 13. I know that the chances of getting a crop are against me, but I prefer to seed down with wheat, and, although I find that no remedy is always effective against the fly, good cultivation and proper rotation are essentials. Even these, however, are no guarantees of a crop. All the grain here this year is surprisingly light and disappointing. Oats are very light indeed; roots also have suffered and are the lightest for years. Corn is now doing tolerably well and, if frost keeps off for a time, we may get an average crop. Altogether I have not seen such an extreme season in all my experience.'—J. C. Wallis.

Mr. Wallis reported from time to time on the fields sown after the barley was ploughed down. He sowed at the date mentioned above (Sept. 10-13) with the soil

in good condition as to moisture and very carefully prepared. The seed was thoroughly cleaned and the wheat came up promptly. Writing on November 16, Mr. Wallis reported that there was hardly any Hessian Fly to be found in this field, while other fields in the same locality sown on August 30 and September 1, were badly affected.

It may be pointed out that September 10 for the county of Middlesex, where Mr. Wallis's land is situated, is the date given in Prof. Lochhead's bulletin as the average date when wheat may be sown there with safety. As has been frequently stated, the emergence of the adult Hessian Flies is dependent to a very large measure on the weather, considerable moisture seeming to be necessary before the flies will leave the puparia. This accounts for a somewhat wide range in the dates when the majority of the flies appear in any season. Prof. Webster, of Ohio, who is one of the highest authorities concerning the Hessian Fly, says :—'The dates after which sowing can be safely undertaken in the State of Ohio vary over a period of at least a month from the northern to the southern latitudes of the State, or approximately from September 10 in the north to October 10 in the south. Wheat sown after the dates mentioned or after intervening dates in intervening latitudes will germinate in normal seasons after the Hessian Fly has appeared, and be free from attack.'

If a farmer who intends sowing fall wheat will watch the weather during August, he may calculate pretty well for himself when it will be safe for him to sow. As Prof. Lochhead has pointed out, 'the farmer, if he wishes to grow wheat free from the fly, must follow the season rather than the almanac ; for the best date for one season may not be the best date for another. For instance, a rainless August, such as we had in 1899 and 1900, will retard the emergence of the fly for two weeks, but an August with a considerable rainfall during the last two weeks will bring forth the flies about September 1, to deposit their eggs ; in which case it will be quite safe to sow according to the dates given.'

From the above facts it is manifest that no definite dates can be fixed upon for every year, but at the same time average dates of safety may be mentioned as the proper time for sowing fall wheat, as far as injury from the Hessian Fly is concerned. Prof. Lochhead says :—'It seems not safe to sow, in ordinary seasons, before September 15, in the counties bordering on Lake Erie, and the tract of land occupying the valley of the Thames. In the next row of counties, including Lambton, North Middlesex, Oxford, Brant, Wentworth, and those bordering on Lake Ontario, the probable safe date would be September 10, while in the counties farther north, the safe date may be placed at September 5.'

The only objection to sowing late—at the end of September instead of at the end of August—is that the plants, it is claimed, have not time to make vigorous roots and tops so as to withstand the cold of severe winters. I have, however, frequently seen excellent crops which were sown late in September, and, as long as the Hessian Fly is abundant, I have no hesitation in recommending farmers sowing fall wheat to delay this operation until the end of September. There certainly is an advantage in sowing early, but this is not sufficient to offset the risk of losing the whole or a large percentage of the crop from the attacks of the fly. Prof. Zavitz, Experimentalist, of the Ontario Agricultural College, has kindly favoured me with the following data :—

'Guelph, May 3.—In the average of four years' experiments in sowing wheat at different dates, we find that by sowing from August 25 to 26 we get an average yield of 44 bushels per acre ; from sowing September 2 to 3, an average of 39·4, and from sowing September 17 to 20, an average of 37·3. There is, therefore, a difference of less than 7 bushels per acre between the yield of the first and last seedings.'

Parasites.—Parasites, but in small numbers, have been reared from almost every district from which we have received specimens of the Hessian Fly this season. In no cases, however, were these parasites in such numbers as to warrant the hope that the Hessian Fly would be very much lessened in numbers next season. Nevertheless, past experience has shown that parasites may sometimes be present in sufficient num-

bers to reduce materially some serious outbreaks of insects without being noticed even by careful observers.

Remedies.—The habits of the Hessian Fly and the best remedies are widely known by those concerned, and with co-operation a great deal can be done to reduce the injuries by this most destructive insect enemy of our staple crop. The best remedies are :—(1) Late sowing, preceded by trap crops sown in August and ploughed down by the middle of September ; (2) Thorough preparation of the land—Prof. Webster lays great stress on this ; (3) The burning over or ploughing down of stubble on fields which have been infested ; (4) The burning of screenings and refuse after threshing ; (5) The use in spring of quick-acting fertilizers upon a slightly injured crop.

CUTWORMS IN GRAIN.

Injury to growing grain by cutworms has been complained of more frequently than usual. By far the widest-spread and most disastrous outbreak was in central Manitoba toward the end of June. Reports of injury were received from Minnedosa, Baldur, Springfield, Kildonan, Niverville, Miami, Roland and Rosebank. The loss in oat fields in the Carman district was great. The Hon. R. P. Roblin, the Minister of Agriculture for Manitoba, who lives in this district, told me when examining these fields with me that he had never seen such an outbreak for twenty years. Many fields of oats which had been eaten bare, were sown again to oats or to barley. One very remarkable feature of this occurrence was that the cutworms, although showing a great preference for oats, would also eat wheat and to a much smaller extent barley, but if they began on any one of these crops, they seldom spread into another. A great many oat fields were seen which had been eaten almost, or quite bare, right up to the edge of a crop of wheat with nothing whatever intervening, and the wheat plants were apparently quite untouched. Occasionally, but very rarely, the opposite to this was observed. At the time of my visit, July 1, most of the cutworms had already attained full growth and it was difficult to find them. Such as were found proved to be the Red-backed Cutworm (*Carneades ochrogaster,* Gn.). This species seems to be very peculiar as to its food habits. It is one of the commonest and most destructive cutworms in the Ottawa valley where it attacks particularly spinach, cabbages, tomatoes, beet-root and onions. In grain fields and on unworked land it confines its attacks almost entirely to the Lamb's-quarters (*Chenopodium album,* L.), a wild spinach, and I have many times noticed grain fields, of both oats and wheat, in which every plant of Lamb's-quarters had been eaten down, but not a single stem of the grain was touched. I was therefore very much surprised to note its unusual habit in Manitoba of attacking growing oats and wheat. Where very abundant, however, it did not always confine itself to a single food plant, for in a garden which I visited at Morden, Man., all kinds of vegetables had been destroyed.

The injuries in grain fields in the Ottawa district in Ontario were by a different species of cutworm, namely, the Glassy Cutworm (*Hadena devastatrix,* Brace). These greenish white caterpillars with reddish heads, unlike many other cutworms, seldom come above the surface of the ground, even at night, but lie hid among the roots of various kinds of grasses, cutting off the shoots at the base. These were reported by Mr. Meredith Caldwell as having done much harm in wheat and oat fields at Luskville, near Eardley, Que. They were worst on clay and marl ridges, but were also very destructive on level clay lands. Prof. Lochhead also tells me that about Gravenhurst, Muskoka, many fields of oats 15 to 20 acres in extent were badly injured by the same cutworm between May 10 and 25. This species as a rule is only troublesome in grain fields sown on grass lands which have

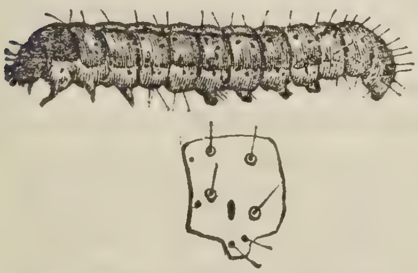


Fig. 3.—The Glassy Cutworm.

recently been ploughed up. As the caterpillars remain beneath the surface, it is almost impossible to reach them with any remedy. In my report for 1898, I refer to an attack by this same cutworm on a field of oats which had been almost destroyed in the last week in May. At that time the caterpillars were almost full grown and very effective work in the way of cleaning the land was done by turning on flocks of chickens and turkeys which devoured large numbers, but soon crows took so many of the young chickens that the poultry had to be shut up again. However, I am quite sure from what I know of the habits of crows that they kept on at the useful work of destroying the cutworms. By June 8 the caterpillars were full grown or they had been eaten by the chickens and crows, and the land was again sown and produced a heavy crop.

Fig. 4.—The moth of the Glassy Cutworm.

A knowledge of the habits of even such common insects as many of the various kinds of cutworms is frequently of much money value to farmers. When insects appear in large and destructive numbers most of them become full grown, and as in the case of cutworms cease feeding at about the same time. Therefore if enough is known of their habits to recognize when they are full grown and consequently will not eat any more, a field may be re-sown at once without any danger and with no unnecessary loss of valuable time.

Cutworms are very seldom noticed until they are nearly full grown and their depredations are so great that they attract attention by their inroads upon a crop. In most instances these attacks are not reported until it is too late for remedial measures. This was generally the case in Manitoba last spring, although the moths were noticed as particularly abundant in 1900 by collectors of insects. Mr. A. W. Hanham, of Winnipeg, writing on the insects of the season in December, 1900, says '*C. ochrogaster* (the parent moth of the Red-backed Cutworm) was by far our most abundant cutworm moth this year. I never went out during their season without seeing them in such numbers as to be a perfect nuisance when collecting.' Practically the same report was received from Mr. E. F. Heath, of Cartwright, Man., Mr. H. W. O. Boger, of Brandon, Man., and Mr. L. E. Marmont, of Rounthwaite, Man.

'Morden, Man., June 6.—In this country the cutworm is undoubtedly with us every spring time, but never before in the history of the country did it work so much damage as it did this season. Usually manifesting itself entirely in the gardens, it this year during the dry month of May invaded the grain fields and in several localities in this district has already done great damage to the growing crops. Many fields of grain were completely eaten off. The grubs seemed to have a preference for oats, but wheat also suffered. One farmer reports 70 acres of growing wheat completely destroyed, and another, 40 acres of oats as bare as though never planted. Reports of serious losses from this cause are general, and the infliction appears to be serious enough to call for investigation. Unlike the grasshopper, the cutworm is a regular institution of the country, and its operations this season show that it may develop destructive powers heretofore unexpected. Some of the farmers here are ploughing up and re-seeding the grain fields destroyed, although this seems to be a useless proceeding while the worms are still in the soil to eat it off again. It may be stated here that there is a general impression that any plant cut off by the worm will not grow again, but this is open to question. In most cases the plant is undoubtedly destroyed, but it is not so in all cases, and grain crops certainly ought to come again, the same as if cut down by severe frost. It is a new experience here for grain fields to be seriously damaged by the familiar cutworm and is no doubt to be accounted for by the unusually favourable conditions. The worm thrives in loose dry soil, but it cannot reproduce itself, because the cutworm is a true caterpillar and does not reach its full development till mid-summer when it completes the round of its existence by becoming a moth.'—J. F. GALBRAITH.

'Morden, Man., June 21.—Since the rains came, the operations of the worms are not so noticeable, but I found them recently as plentiful as ever in my garden, and a good many small ones also which appear to have been recently hatched.'—J. F. GALBRAITH.

I visited Mr. Galbraith's garden at Morden on July 1 and had an opportunity of seeing the great destruction which had been wrought by the cutworms among peas, cabbages, cucumbers and other vegetables. At that time there were none of the insects to be found, and Mr. Galbraith and others in the same place were of the opinion that they disappeared about June 20. Some Indian corn, which appeared above the the ground after that date, was growing vigorously and had not been touched.

Telegram.—'Miami, Man., June 10.—Brownish cutworms destroyed oat fields. Will it be safe to resow immediately with barley ? Worms still numerous. Wire.'—THOS. RENWICK.

Reply.—'Do not resow for ten days, am writing.'—J. FLETCHER.

After telegraphing the above reply, Mr. Renwick was written to for specimens, and advised to watch the development of the cutworms, and not to sow until some of them were seen to be changing to chrysalids. The poisoned bran remedy was also recommended.

'Miami, Man., June 15.—I send you cutworms now. I looked carefully, but could not find a single chrysalis. The worms are still numerous, but the weather is now damp and wet, and they appear to be cutting the grain off a little above the surface, instead of below it as in the dry hot weather, so I do not think they will now do so much damage. A good deal of seed grain has been lost by re-sowing too early. One farmer had 70 acres of wheat destroyed. He re-sowed at once with wheat and also lost it. On my own adjoining farms the worms do not touch the wheat, although numerous in the ground. Another farmer sowed a mixture of wheat and oats for feed ; the worms took nearly all the oats. On the same farm a five acre patch was completely cleared in the centre of an adjoining wheat field. It looks as if there were two varieties at work, one of which will not touch wheat. I have farmed here for twenty years and never before sustained any damage from cutworms. Do you think they will be likely to recur again ? I notice they also eat barley, which is only now coming up, since the rains came.'—THOS. RENWICK.

'Brandon, Man., June 21.—The Director wishes me to send you specimens of some cutworms which are doing a lot of damage here this year. I am mailing you under separate cover one feeding on flax and another on oats ; the loss from the one feeding on oats is quite serious. Southern Manitoba papers are full of accounts of the loss in oat fields, and Sir Wm. Van Horne's foreman at Selkirk writes me that he has lost nearly all his oat crop from their ravages, over 100 acres. We have only lost four plots of oats of one-twentieth of an acre, and two plots of flax. They are still working at the flax but have about stopped on the oats.'—S. A. BEDFORD.

'Winnipeg, December 10.—So far as I have been able to learn, the damage occasioned by the ravages of the cutworms in oat fields occurred mostly in the Balmoral district, north of Winnipeg, and throughout Springfield, east of this city.'—GEO. BATHO.

Remedy.—The well known poisoned bran remedy was about the only one which could have been used effectively against such an outbreak as that recorded above. This could certainly have been used with much advantage in gardens. For field practice, probably the best course in such an exceptional visitation was that adopted by Mr. Renwick, viz., to watch for the date when the cutworms become full grown and then re-sow the land either with a crop for green feed or late roots. When grain has been sown on stubble in the West, turning the land down for summer-fallow would be advisable.

The Red-backed Cutworm is the caterpillar of a brown moth (*Carneades ochrogaster*) about an inch long when the wings are closed, which lays its eggs in the autumn upon weeds and other vegetation. The eggs hatch the following spring and the young caterpillars are seldom noticed while they are small. Land, which is allowed to bear a crop of weeds in the autumn, is therefore more likely to attract the moths to lay their eggs than land which is kept clean. The destruction then of all useless vegetation and particularly of weeds in the autumn is a good preventive remedy against cutworms of many kinds.

GRASSHOPPERS.

Locusts, or as they are more generally called Grasshoppers, have again this year been the cause of considerable loss in some places, particularly in Central Manitoba and in parts of the interior of British Columbia. Outbreaks more or less severe were also reported from western Ontario, New Ontario, and Nova Scotia, but these occurrences, although severe, were of short duration. Much more important were the ravages of grasshoppers in the West.

Fig. 5.—The Rocky Mountain Locust.

In Manitoba, spring opened later in 1901 than the previous year ; as a consequence, grasshoppers also appeared later, and, as the conditions for growth of all kinds of crops were most favourable, there was every hope that there would be no injuries by grasshoppers. The appearance of the crops was so unprecedentedly good and there was on the prairie such exuberant growth that it seemed to farmers impossible that these insects could affect the crop. However, in certain localities active measures were necessary. Some fields of large extent were stripped bare, and others were only saved by energetic and persistent work. On the whole, therefore, although loss from these insects did not appear to affect the enormous total grain yield of the province, 85 million bushels, it was a serious matter for some farmers in the localities visited.

The development of this outbreak is described in the following correspondence :—

'Winnipeg, April 15.—Last week we had very fine warm bright days, and I have received a report from the Stockton and Treesbank districts that young grasshoppers are hatching out in millions. Yesterday was cold, and last night we had frost ; to-day it is thawing a little. I am hoping that this severe weather will finish most of the grasshoppers, or at least be a check to them.'—Hugh McKellar.

'Winnipeg, May 29.—I regret to advise you that grasshoppers are again becoming a menace to the farmers in the districts where they were prevalent last year. Ten days ago I visited the districts north of Methven and east to Treesbank. Only very few could then be found, all in the first stage. It was impossible at that date to estimate what another week or two would bring about. I am now advised by Mr. Norman Criddle and Mr. Cullen, of Aweme, and Mr. Jerome Henry, of Stockton, that they are likely to be as bad as last year, although you will notice that the date is later than last year's trouble. Farmers are asking for Paris green and I have already sent out 50 pounds by express. This is to carry on the fight against them on the plan given by Mr. Norman Criddle, and referred to in your last annual report. I have also just been advised that locusts have appeared in great numbers on the Eastern Mennonite reserve, municipality of Hanover, at the village of Chortitz and other villages in the district. The Minister of Agriculture would be pleased to have you spend a few days here before going west to the Territories in connection with your summer's work. I should be pleased to have any suggestions you wish to offer in the way of fighting the hoppers.'—Hugh McKellar.

'Winnipeg, June 6.—I have just received your favour of the 3rd inst., and will now report further on the grasshoppers. The last two weeks of May were dry and the last week hot and dry. Everything was favourable for the grasshoppers, while wheat

was, practically speaking, at a standstill. The grasshoppers are later this year than last, being only in the second or third stage when I saw them on Friday last ; in fact, many of them were still in the first stage, and I suppose others were not yet hatched. You could readily notice, as you drove from farm to farm, where they were doing damage, a strip was eaten clean off from 3 to 10 feet wide, and sometimes a corner extended in, on a rise of ground, 20 feet or more. Farmers told me that, where fields were ploughed last spring or early this spring, no hoppers had appeared. The trouble is all from stubble fields not yet ploughed. I have great sympathy with the farmers ; they could not carry out the instructions to the letter as to ploughing all stubble. You will remember that, where we went together last year, and where the trouble is again this season, the farmers on that light soil summer-fallow nearly half of their land each year. Last year the harvest extended almost to snow fall on account of the wet weather, so that farmers could not possibly plough all their stubble land. This year spring conditions were so favourable that it was generally thought that we must be going to have a very big crop ; the farmers, accordingly, tried to put in as many acres as possible, feed for horses was scarce, and the result is that the stubble fields are still unploughed, and their horses are poor. The only remedy I can see for cleaning out the hoppers, if they continue to appear annually, is for farmers to curtail their farming operations, and seed down part of the present cultivated land to brome grass, so that they can handle the remaining portion before the grasshoppers hatch in the spring. The outlook, however, is now hopeful. Rain commenced to fall in the western part of the province on Saturday, coming to Brandon on Sunday, and on to Winnipeg by Monday night. Tuesday was wet, Wednesday cloudy and some misty rain, and today we had wonderful rain and a storm of rain and snow, which of course melts as it falls. I think these conditions are general over the province. I shall anxiously watch what effect the rain has on the hoppers, and, as soon as the weather fairs up, I shall again visit the districts. I hope it may not be for a week or ten days and that this weather will finish the grasshoppers for the season. The growth of wheat and all vegetation will be so rapid that the grasshoppers will be lost in it. I shall be pleased to report to you from time to time about them.'—Hugh McKellar.

'Winnipeg, June 17.—Although the grasshoppers are so troublesome this season, yet I do not think that any great majority of them are *M. spretus*. I have letters from Morden, Altona and Chortitz, as well as from all points where they were numerous last year, asking for investigation and instruction. I understand that they are very numerous at these points. My intention is, at present, to go with you on a flying trip through the whole district to all of these points, so that you may be thoroughly acquainted with the conditions that exist, and may be able to advise the Department regarding any further work which you may think advisable. No doubt some meetings will be held and addresses delivered to the farmers. Rains continue every other day, and from all parts of the province come reports of most wonderful growth of all kinds of vegetation. We have sent out over 1,000 pounds of Paris green, and I am receiving very favourable reports of the success of farmers in destroying the grasshoppers.'—Hugh McKellar.

Mr. McKellar's expectations as to the early disappearance of the grasshoppers were only partially fulfilled. The wonderful growth of all vegetation certainly prevented what would have been serious loss in an ordinary season.

'Brandon, Man., June 28.—On the light land near Sewell, grasshoppers have been very bad lately. I saw a field of over one hundred acres sown with wheat with not a solitary blade of grain or grass standing—only a few Artemisias. Grasshoppers by the millions were on the roads. I am sending you a few by mail.'—S. A. Bedford.

The grasshoppers sent with this communication were all the Lesser Migratory Locust.

At the request of the Provincial Minister of Agriculture, I was instructed by the Honourable Sydney Fisher to proceed to Manitoba to visit the infested districts and,

if possible, assist in the remedial measures which were being taken to prevent loss. I reached Winnipeg on June 30 and at once reported to the Honourable R. P. Roblin, and talked over the whole matter with him and his deputy, Mr. Hugh McKellar. Leaving Winnipeg on July 2, in company with Mr. McKellar and the Rev. W. A. Burman, I visited all the localities from which reports of locusts' injuries had been received. The following report made to Mr. Roblin at the conclusion of this investigation recounts all the chief features of the expedition :—

WINNIPEG, MAN., July 6, 1901.

The Hon. R. P. Roblin,
Minister of Agriculture and Immigration,
Winnipeg, Man.

DEAR SIR,—I have the honour to inform you that in accordance with your request I have made an inspection of those districts in Manitoba from which complaints have been received by your Department of injuries to crops by grasshoppers, so as to apprise myself of the actual state of affairs and the conditions prevailing, so that, if necessary, I might be in a position to advise you whether, in my opinion, any further steps could be taken by your Department to reduce injury and control this pest.

I left Winnipeg on the morning of Tuesday, July 2, in company with Mr. Hugh McKellar, the Chief Clerk of your Department, and Rev. W. A. Burman. We reached Rosenfeld Junction at 10 a.m., and started at once and drove to Altona (8 miles). Here we were joined by Mr. John Hebert, who kindly came with us to a farm belonging to Mr. Isaac Bergen (4 miles distant), and showed us a field of wheat in the edge of which a swarm of grasshoppers was doing some injury. These were chiefly the Lesser Migratory Locusts (*Melanoplus atlanis,* Riley), a native species, which on several occasions has been the cause of considerable injury. The insects were for the most part immature and unable to fly. A similar occurrence of the grasshoppers in the same state of development was seen at Rosenfeld when we left the train. There were in both of these places some mature grasshoppers with fully developed wings, by which the identification could be confirmed, and also in smaller numbers the Pellucid Locust (*Camnula pellucida,* Scudd.), and the Two-striped Locust (*Melanoplus bivittatus,* Say), but these two latter species were in smaller numbers than the first. At this point good work could be done, as was explained to the farmers, with hopper dozers or the Paris green mixture. These grasshoppers had come from a piece of land left for summer-fallowing where the eggs were laid last autumn.

We then drove 6 miles to Plum Coulee, finding grasshoppers rather numerous all the way, and near Plum Coulee noticed a few of the true Rocky Mountain Locust (*Melanoplus spretus,* Uhler) mixed with the Lesser Migratory species. This occurrence should warn the farmers to be on their guard and to make every effort to plough down, as advised by your Department, all land in crop this year, either this autumn or early next spring before the eggs hatch. It is well known that, although all of the injurious locusts lay their eggs upon bare spots in the prairie, the condition of the soil where a crop is grown is exactly what suits them best for egg-laying, and that the females will by preference resort to these fields to deposit their eggs. During the whole of this investigation we found it an almost invariable rule that where locusts were injuring a crop, they had originated in a near-by stubble field, or in untilled land once in crop but now neglected. Changing horses at Plum Coulee, we drove past Winkler to Morden (16 miles), where we passed the night. From Plum Coulee to Morden colonies of the Lesser Migratory Locust were seen at several places. At Morden, Mr. Galbraith showed us land which had been stripped by the Red-backed Cutworm (*Carneades ochrogaster*), a caterpillar of a species of moth which has been very destructive in many parts of the province during the month of June, particularly to the oat crop, in gardens and flax fields to a much less degree, to barley and in one or two rare instances to wheat. The preference, however, has been decidedly for oats. In the Carman district the preference shown for the oat crop was very remarkable, great injury having

been done, and where wheat fields came right up to the oats that crop appeared to be untouched while the oats were entirely devoured, even twice in some places where the fields had been re-sown too soon. The caterpillars seem to have attained their full growth about the third week in June, and up to that time any growth on the infested oat fields was destroyed. The remedies against cutworms are the keeping down of all weeds in the autumn upon which the eggs are laid or, when the caterpillars are found to be present in the spring, the distribution over the ground of the poisoned bran bait, which has been fully described in the last annual report of the Central Experimental Farm.

Leaving Morden early we drove 7 miles to Nelson, where the Lesser Migratory Locust was found in large numbers, mixed with the Pellucid and Packard's Locust (*Melanoplus Packardii,* Scudd.). We now drove to Rosebank (8 miles) swinging off to Mr. Pearce's farm where locusts were reported. These we found were almost all the Lesser Migratory and the Pellucid Locusts, many of them not mature. Near to Rosebank we found the Rocky Mountain Locust in small numbers. From Rosebank we took the Canadian Northern Railway to Fairfax, which is almost 14 miles southeast of Souris. From this point we drove a mile east to the farm of Mr. W. D. Moffat. Here we found the true Rocky Mountain Locust in enormous numbers, all mature, but still in a soft condition. Mr. Moffat was ploughing down all his stubble land, and intended poisoning with Paris green the following day. We next drove to Elgin where we passed the night, and proceeded to Hartney the following morning. Owing to the very heavy rain during the night, not many grasshoppers were moving, but the Lesser Migratory species and a few of the Rocky Mountain Locust were seen at several places and in too large numbers to be ignored or neglected. We took the train from Hartney on the morning of the 4th to Brandon and attended the annual champion ploughing match on the Experimental Farm in the afternoon. We heard of locusts in large numbers 4 miles north of the Experimental Farm, and a few specimens of the Rocky Mountain Locust were taken on the farm itself. At this point Mr. F. D. Blakely, of the *Nor-West Farmer,* joined our party. Leaving Brandon at 7.40 on the morning of the 5th, we went to Sewell, where great injury has been done this year, and where there was also much loss last year. Mr. Kellet drove us to his fields where the insects were in incredible numbers, almost all the Lesser Migratory species, but also small numbers of several other native species of less importance. Adjoining Mr. Kellet's land were several other crops of wheat which were being rapidly devoured, notably one large field of 200 acres, owned by Mr. Thomas Greenwood. These insects had undoubtedly migrated to the crops from unploughed summer-fallows. Nothing is yet being done, but much could still be accomplished by using the Paris green mixture. Everywhere through the crop, where bare ground showed, were patches of locusts from 50 to 200 or 300 together, and on the summer-fallows, with the exception of a few weeds, such as two of the Wormwoods (*Artemisia frigida* and *A. Canadensis*) and strangely one kind of grass (*Panicum dichotomum*), all vegetation was being rapidly devoured right down to the ground.

Driving towards Douglas, and 3 miles east of the farms mentioned, magnificent crops were seen, but the work of the grasshoppers was evident in many places. The farms of Mr. Moore and Mr. R. Russell were visited. At that of the latter an excellent illustration was found of the value of the Paris green mixture as a practical remedy against locusts. Adjoining a piece of unploughed summer-fallow was a piece of good wheat swarming with the Lesser Migratory Locust, most of the insects in a dying condition. For a space of 50 yards from the edge of this crop, where the remedy had been only once applied two weeks before, the ground was literally strewn with dead grasshoppers, and all along the edge of the head land, where they had gathered during the wet weather, the dead insects were lying in such numbers as to resemble a windrow ; on one spot 117 were counted in 18 inches square. At a corner of a field where, owing to their numbers two applications had been made, the dead locusts were even more numerous. At Douglas we heard of considerable injury having been done

and of the good effects of the Paris green mixture. We left Douglas at 2.30, and drove to Treesbank (25 miles).

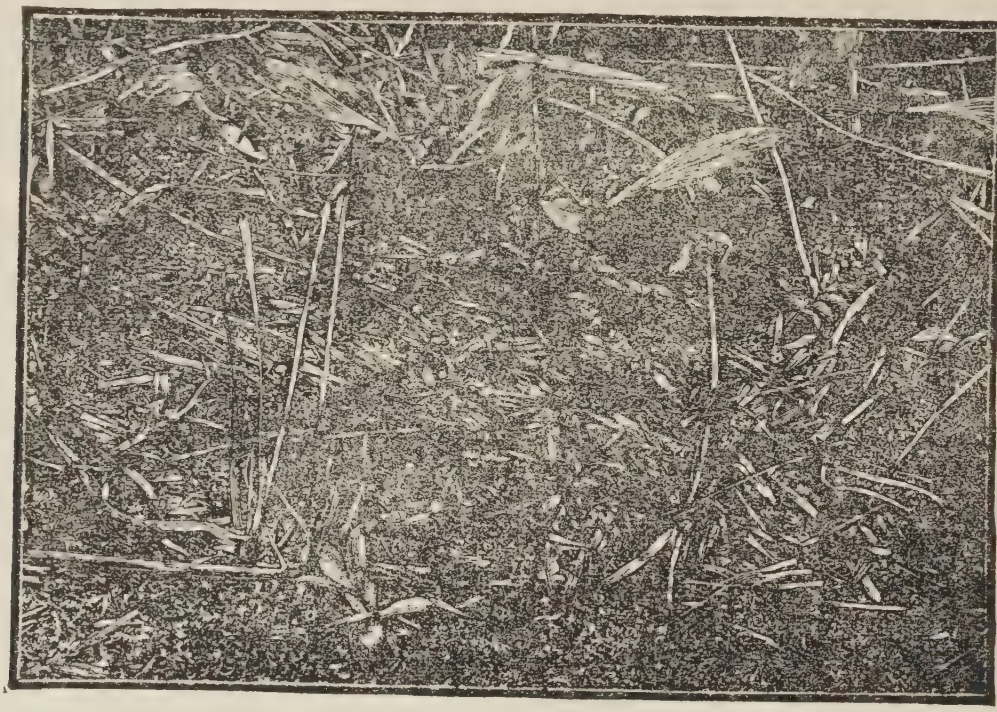


Fig. 16.—Dead Grasshoppers, killed by Paris green mixture.
(From photograph by F. D. Blakeley, kindly lent by the *Nor'-West Farmer.*)

One and a half miles south of Douglas, on the farm of Mr. Agnew, much harm was being done, and also on the land of Mr. H. T. Sibbett, two miles further on. At this point a remarkable instance was observed of the attractive nature of horse manure to locusts. A manure pile outside a stable was so entirely covered with the insects that they could only be likened to the scales on a fish or the shingles on a roof. When disturbed they flew off like a swarm of bees. Here the first instance of the female locusts (*M. atlanis*) laying their eggs was observed. A few miles further on we came to the farm of Mr. T. Fortune, where we found a fine crop of wheat, which had been saved by the use of the Paris green mixture, on land where everything had been destroyed last year. We next inspected crops at Aweme, where magnificent fields were found, all of which had been similarly saved. Mr. Cullen used the remedy regularly, and has saved his crop. The same may be said of Mr. Criddle's crops at the same place. Too much cannot be said of the commendable and disinterested zeal which has been shown by Mr. Norman Criddle and his brothers in experimenting with this remedy, which has been developed and much improved from his experiments, and those of his neighbour, Mr. Vane. As a result he has saved good crops where he would, in all probability, have lost everything. Some of his neighbours are following his example with the same good results. The only assistance he has received is just such as you have given all other farmers who have applied to you, namely a supply of poison.

Leaving Treesbank at 6.30 on the morning of the 6th, we drove 5 miles west to some swarms, which had been previously located by Mr. McKellar, and found the Rocky Mountain Locusts on Mr. Jackson's farm at Banting, where they were injuring wheat around sloughs. Further west, at Mr. Geo. McCluskey's farm, large numbers of the Lesser Migratory Locust were doing much harm on a sandy field. Here a few dead locusts were noticed, which had been killed by parasites (*Tachina*) and the Black Blister Beetles were found, presumably looking for the eggs upon which the grubs of the beetle are parasitic. Returning to Treesbank, we drove to Stockton, calling at the farm of Mr. Jerome Henry, who has saved his crops by using the Paris green mixture. Taking the train at Stockton, we reached Winnipeg at 7 o'clock on the evening of the 6th.

In reply to your inquiry, and as a result of this investigation, I beg to say that I consider the remedy which you have been this year advising, an unqualified success. Through the work of your Department all the known methods of fighting outbreaks of locusts have been tried, and as a result of last year's work special attention has this year been given to the cheap, easy and effective remedy of poisoning with Paris green. The results so far obtained are most satisfactory. If persisted in for another month, excellent and heavy crops will be reaped from many fields, where, otherwise, nothing could have been expected. The efforts of your department in giving instruction and encouraging farmers in the work of exterminating this pest have been all that any Government could do, and I approve most heartily of what has been done. The only suggestion I could have made, would have been to use the hopper dozers, as they were on hand, in some localities earlier in the season, and that possibly a weaker mixture of Paris green than that now used might be experimented with, so as to reduce somewhat the cost of the materials. This, however, I believe, is already being experimented with. Your Chief Clerk, Mr. McKellar, is thoroughly well acquainted not only with the different species of locusts likely to develop into crop pests, but also with their habits, and he has also used or tried all the known methods of remedy or prevention. All of these points I have discussed with him in the field during the past three seasons, and I must congratulate you on the great energy he has shown in giving information and help whenever and wherever needed by farmers who were unfortunate enough to have their crops infested by grasshoppers.

In conclusion, I beg to thank you for this opportunity of visiting the infested localities and seeing the good work which has been done under your orders. I believe the conditions in the districts above mentioned are still sufficiently alarming to require continued effort being put forth of the same nature as you have already adopted, and I most earnestly advise every farmer in all localities where locusts are, or should appear in numbers this autumn, to make a point of ploughing down deeply all stubbles, either before winter or early next spring.

I have the honour, &c.,

JAMES FLETCHER.

Reference is made above to a somewhat unusual injury by the Rocky Mountain Locust, in which wheat had been eaten down for a considerable space around small sloughs in wheat fields. Mr. Hugh McKellar writes of this :—

'Winnipeg, October 7.—You will remember that we noticed with some surprise the wheat plants eaten off around sloughs which were full of water at the time we saw them. This was on Mr. Banting's farm, near Treesbank. Mr. Banting tells me as an explanation of this that, at the time he was ploughing before seeding, grasshoppers were very abundant in the field, many of them being buried and smothered, but some always escaping and being driven before the plough. These took refuge in the grass of the sloughs in which there was no water at that time. All the land about these sloughs was ploughed, so that the only green place where they could get food was among the grasses in the sloughs. When the grain came through the ground, the grasshoppers at once moved into it, and, rains coming on, the sloughs filled up with water and all of the grasshoppers were driven out. The result was what we noticed—a complete circle around the sloughs eaten bare.'

The following interesting report by Mr. Norman Criddle is inserted in full on account of its scientific and practical value.

'Aweme, Man., Oct. 25, 1901.—These notes, taken on the spot, will give an idea of the locust outbreak this summer and how it was controlled in this district :

April 28.—First locusts noticed.
May 15.—Locusts extremely plentiful on abandoned farms.
" 21.—Most of the locusts are out.
" 26.—Locusts begin attacking wheat. Nothing has been done to stop them. Several hundred insects to the yard seen.

May 27.—Locusts are sweeping off the stubble on to the wheat fields.
" 28.—I spread poison up half a mile of wheat for the first time this morning, which has completely checked them, while on the adjoining fields they have advanced twice the distance. A shortage of Paris green experienced ; none to be had in neighbouring towns.
" 29.—I spread more poison ; many locusts dead where it was spread yesterday. The insects have made no further advance, but where not checked, they are rapidly clearing the fields. Lots of Gray Blister-beetles noticed.
" 30.—Nearly everyone is scattering poison. It is having a marvellous effect in checking the advance. Millions are being killed, while others continually replace them from the stubble fields.
" 31.—Locusts have made great advance toward the wheat fields, and some have entered them. We received 50 pounds of Paris green from the Government through Mr. McKellar yesterday. A lot has been spread. Have tried poison mixed with horse dung instead of bran.
June 1.—The horse dung has proved a great success : it is no sooner spread than locusts can be seen leaving the wheat and swarming toward it. There are on an average 25 to the foot dead where it was spread yesterday. Many more are dying.
" 3.—Horse dung has taken the place of bran ; it is much better. Locusts are well under control in this part of the settlement. Some have hatched on the prairie lately, mostly Gomphocerus species.
" 7.—Last three days cold, snow and frost. Locusts very sluggish. Most of the Tachina flies appear to have been killed.
" 9.—Locusts begin to fly.
" 13.—About one-sixth can fly.
" 18.—A quarter can fly.
" 20.—Three-quarters can fly. Mr. Cullen and I found many killed by Tachina grubs on a stubble field. They can be found nowhere else.
" 24.—Locusts begin flying away.
July 2.—Lots flying.
" 3.—Many flying into the wheat and lots over it.
" 6.—Countless numbers flying into the wheat. A few are laying eggs. Great quantities of poisoned mixture are being scattered about.
" 7.—Lots more flying into the wheat and away. They are doing some damage by eating the heads of wheat.
" 11.—Poison has been spread on an average every other day since May 28.
" 13.—Locust mites are getting plentiful.
" 15.—Several locusts found with hair worms in them about 8 inches long.
" 22.—Found a great many infested with Tachina grubs. The locusts had already been killed by poison. One locust had 11 maggots in it.
" 25.—Locusts have ceased migrating. Several found dead on ground ; cause unknown.
" 26.—Two found at different points clinging to weeds. Killed, apparently, by the fungous disease *Empusa grylli.*
Aug. 10.—Most of the locusts are depositing eggs.
" 19.—Eggs very plentiful in patches. Many of the pods have been broken open and the eggs destroyed by predaceous ground beetles (*Amara*), which are very abundant.
" 20.—Locusts laying eggs for second time.
Sept. 2.—Locusts have practically all died or have been killed. A few females yet remain.

'The poison mixture as now used by us consists of 1 part of Paris green, 2 of salt, and 35 to 40 of horse dung (by measure). Mix thoroughly, adding enough water

to make soft, without being sloppy. Scatter well, in quantity according to the number of locusts. They will be attracted for at least 40 feet by the smell. The horse dung is preferable when fresh, but will do several weeks old, even after being washed considerably by rain. The above remedy has proved and must prove a great success wherever used correctly. A simple way to keep locusts on the edge of fields is to sow a strip of rye around them. This grows much more rapidly than wheat and takes a lot of eating down to kill it. By this means the locusts are held where they are easily got at. Ploughing a strip next the wheat was also found effective. In this section all used poison and only a few acres of crop were destroyed. I am convinced that, had we begun the fight earlier, hardly a bushel of grain would have been lost. It is no exaggeration to say that dead locusts could be gathered up in wagon loads and at times be smelt for half a mile. Mr. Cullen, or Mr. Fortune, and one of our family, with horse and rig, kept the locusts from about 600 acres during the entire season. The locusts consisted mostly of the Lesser Migratory Locust (*M. atlanis*). *M. Packardii* was numerous, and there was a small percentage of *M. spretus, M. bivittatus, Camnula pellucida* and *Gomphocerus* species. We are greatly indebted to the Honourable Minister of Agriculture and to Mr. McKellar, his Chief Clerk, for promptly forwarding Paris green when required, and for two visits of the last-named gentleman.

'In reply to your inquiry, we find the following treatment very useful in preventing locusts and crickets from eating binder twine, as they are very apt to do when the grain is standing in stooks. Soak the balls of twine in a solution of 2 pounds of bluestone to 12 gallons of water for half an hour, then dry thoroughly. Introduced by Mr. H. Vane, of this place.'—NORMAN CRIDDLE.

Predaceous and parasitic insects seem to have increased at Aweme later in the season as the following extracts show :—

'September 15.—I send you two beetles of a species which has several times been found among locusts' eggs, the pods of which were broken open apparently by them. These beetles have been very abundant during the summer in company with several others somewhat similar.'—N. CRIDDLE.

The beetles referred to above were Carabidae of the genus *Amara,* perhaps *A. carinata,* Lec. or *A. laticollis,* Lec., or a nearly related species. Unfortunately the knowledge of this genus is very imperfect. No specialist will undertake to name forms in this portion of the genus with certainty.

'November 15.—I deeply regret that I was unable to get you the locust eggs. All the best ground was ploughed before I had time to hunt. I am forwarding a few partly broken pods. The coating around the eggs is extremely thin this year, much more so than usual ; it is therefore almost impossible to avoid breaking them. The majority of pods in most places are already broken open and the eggs partly destroyed, principally by a small white larva. I am sending a small box containing some of these, some broken pods attacked and a few other insects found in the vicinity of the eggs, which may have helped to destroy them and which may prove of interest.'—N. CRIDDLE.

The white larvæ were those of one of the small blister-beetles, well known parasites on the eggs of locusts. A few of them had changed on arrival at Ottawa to the very interesting pseudo-pupae, a curious extra stage of development which occurs in this family of beetles.* There was also the cocoon of a hymenopterous parasite. Upon inquiring from Mr. Criddle if he had noticed any unusual abundance of blister-beetles, he replied that they were decidedly more numerous last summer than usual, especially a small gray kind, of which several hundred would be seen within a few yards, and then perhaps no more for half a mile. No damage to crops by these beetles was noticed.

Mr. F. D. Cullen, of Aweme, reported that one hundred acres of his crop were destroyed by grasshoppers before he received the Paris green, and that they were attack-

* These proved to be *Epicauta Pennsylvanica,* DeGeer.

ing another hundred acres from every side, but that a few doses of Paris green stopped them promptly and the dead grasshoppers could be gathered up with a shovel. This hundred acres yielded 1,700 bushels of wheat.

Mr. Criddle's investigations and experiments are of great interest, and his discovery that horse droppings may with advantage be substituted for bran is of great practical value. This material is always available on a farm, while bran, which was formerly used as the best vehicle for distributing the poison, costs money and is neither so suitable for holding the poison nor so attractive to the locusts. Mr. Criddle was led to experiment with horse droppings from noticing that locusts flocked to this material whenever it was found lying on roadways. The mixture of horse droppings, salt and Paris green is undoubtedly the most attractive, fatal, and cheap remedy for locusts which I have ever seen used. It is easily distributed with a trowel, or wooden paddle, from a barrel placed in a wagon and driven round the edge of the field. It can be readily scattered for a distance of 20 or 30 feet out into the crop, by a person standing in the wagon. It is only when the locusts are in excessive numbers that this poison mixture would require to be distributed as frequently as was done by Mr. Criddle last summer. On Mr. Russell's farm, poison scattered a fortnight before my visit, although there had been several showers of rain since it was put out, was still being eaten by grasshoppers with avidity, and the insects were found dying all through the crop. As Paris green is insoluble, the mixture remains in an effective state as long as the adhesive properties of the horse droppings last. This remedy should be tried at once wherever locusts occur in destructive numbers. It will be noticed from my report printed above and from Mr. McKellar's and Mr. Criddle's letters, that in almost every instance where locusts were in large numbers, they had originated in land which had been under crop the previous year and which had been left for summer-fallowing during the present season. This accentuates the importance of early summer-fallowing. The ploughing down of all stubbles in localities where locusts have been abundant, should be attended to immediately seeding operations are finished. If this is impossible, it should at any rate be done before the insects reach the winged condition.

The species of locusts responsible for most of the injury in Manitoba were the Lesser Migratory Locust, the Rocky Mountain Locust, the Two-striped Locust, Packard's Locust and the Pellucid Locust. After leaving Manitoba and proceeding westward last summer, it was observed that locusts of all kinds were unusually scarce until British Columbia was reached. In this province much harm was done by these insects at certain places down the Okanagan and Nicola valleys. At the Coldstream ranch, at Vernon, B.C., fodder plants and orchard trees were injured to a considerable extent, and in driving down the Nicola valley from Kamloops to Nicola Lake, the grass on the ranges was found to be much reduced in quantity. Shrubs and Aspen Poplar trees in gullies were also much defoliated. Crops of oats and other grains, as well as turnips and garden plants, were in some places stripped bare. This injury in the Nicola valley was chiefly by the Pellucid Locust, and *M. affinis*, Brun., a species very closely resembling the Rocky Mountain Locust in colour, but closer, I am informed by Mr. E. M. Walker, of Toronto, to *M. atlanis*. It is bright-coloured like the Rocky Mountain Locust, but smaller in size. *M. affinis* was also taken at Kelowna on Lake Okanagan. The locust which was attacking fruit trees at Vernon, was the Lesser Migratory Locust (*M. atlanis*).

ROOT CROPS AND VEGETABLES.

The turnip crop in Canada during the past year, as a general thing, has been good, somewhat affected, however, in some places by the dry weather after midsummer. There was little complaint of the Turnip Flea-beetle, probably on account of the favourable spring.

The Turnip Aphis (*Aphis brassicæ*, L.).—The most serious injury was by the Turnip Aphis in New Brunswick and Nova Scotia, concerning which many letters were received. This attack on the turnip crop seemed to be a new experience to most of the correspondents in the Maritime Provinces. Spraying with coal oil emulsion or with whale-oil soap (1 lb. to 6 gallons of water) at the time the colonies first appear in July and August was recommended, also ploughing the tops down deeply as soon as possible after they are cut from the roots in autumn so as to destroy the eggs.

Cabbage Worms (*Pieris rapæ*, L.).—The green caterpillar of the imported Small White Cabbage Butterfly has been abundant and troublesome this year in many parts of the Dominion. In British Columbia it has spread rapidly over the whole province. The first record of its occurrence there was in 1899 at Kaslo, on Kootenay Lake. Last summer it reached Vancouver Island and appeared in numbers, which were very much greater this year. It was also extremely common in all the older provinces, being frequently referred to as 'the worst enemy of the cabbage.' Mr. C. H. Young, of Ottawa, observed the butterflies in such numbers in the month of June flying over cabbage and turnip fields, that he likened them to a heavy fall of snow. The best remedy, in my experience, for this insect on cabbage, and one which on the Central Experimental Farm has always proved effective, is Pyrethrum Insect Powder, 1 lb., cheap flour, 4 lbs., the whole to be kept for 24 hours in a tightly closed receptacle, the powder to be then dusted over the infested crop by means of special bellows or from a cheese-cloth bag. When, as is frequently the case, these insects attack turnip fields, spraying with Paris green or some other active poison is permissible. This may be done with perfect safety up to September. Two sprayings during the summer are the utmost that will be required, even in a bad season. On smooth-leaved turnips it will be necessary to dissolve a pound of soap in each 25 gallons of water before mixing with the Paris green, or the poison mixture will not adhere to the foliage. On cabbages, Paris green and other poisons must never be used. The insect powder answers all purposes without any danger, which is not the case with Paris green, because the caterpillars eat channels into the heart of the cabbages into which the poison is washed.

The Variegated Cutworm (*Peridroma saucia*, Hbn.).—Notwithstanding the plague of this insect on the Pacific coast last year, there was practically no recurrence of the trouble in 1901. In two instances only was damage to garden crops reported. These were both by Rev. G. W. Taylor, near Nanaimo, on Vancouver Island. Mr. Dashwood-Jones of New Westminster, who made observations on this insect for me last year, reports that moths were seen in some numbers in June, but that no harm was done to growing crops. Mr. J. W. Cockle, of Kaslo, an enthusiastic and careful student of insects, kindly sent me a cluster of the eggs laid at Kaslo, in the middle of June, from which a large brood of caterpillars was reared to maturity, all the moths emerging before winter, about the end of August. Mr. Jones gave the following dates from his notes which add somewhat to the life history of the species :—'The first specimen I saw of the moth of *P. saucia* was on May 20. The eggs hatched on May 30. The last date I saw any moths of the spring brood was on June 13. At the same time I found cater-

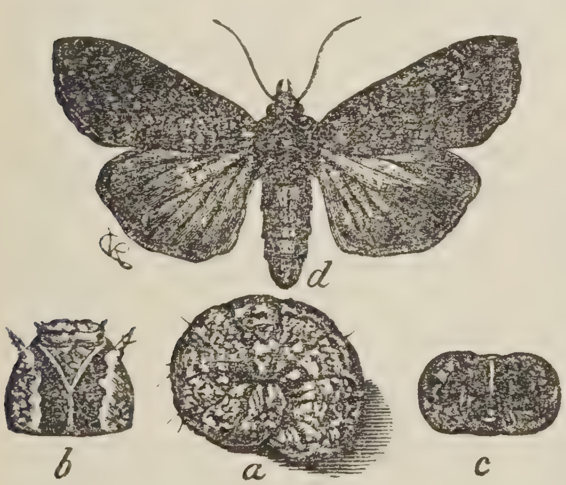


Fig. 7.—Variegated Cutworm ; *a*. caterpillar ; *d*. moth ; *b*, *c*, head and segment of caterpillar.

pillars. By June 23 they were rather troublesome under glass, but of course were soon checked. During the first week of July, I heard of the caterpillars in small numbers in several places, but they soon yielded to the poisoned bran treatment. On July 11, I found caterpillars of all sizes in potato patches, and also the first chrysalids, three in number. On July 22, the greater part of the caterpillars were changing to chrysalids, only small ones to be found. On July 31, the first moth emerged.'

Fig. 8.—Variegated Cutworm; eggs; *a*, an egg enlarged.

In visiting, last summer, many places in British Columbia which had been devastated by the Variegated Cutworm during 1900, I made particular inquiries concerning this insect, but except in the localities mentioned above, it had not been observed at all. I was shown, by Mr. Tom Wilson, a collection of moths reared from cutworms which had done great injury in his garden at Vancouver in 1900 and was surprised to find in almost equal numbers with the moths of the Variegated Cutworm, specimens of the beautiful moth *Eupsephopæctes procinctus*, Grt., the caterpillars of which Mr. Wilson assured me were, in his garden at any rate, in equal numbers with those of *P. saucia.* He had noticed that the larvæ had differed a good deal, but had saved no specimens. I have pointed out frequently to my correspondents that I shall always be very much obliged for living specimens sent by mail of any injurious insects, however abundant or common they may be. I should in this instance have been particularly glad to see some of the cutworms of the moth *E. procinctus.*

Cutworms.—Cutworms of various kinds in different parts of the Dominion have as usual been the cause of more or less injury in gardens. One of the widest-spread and most destructive species of which specimens have been sent in from localities ranging all the way from Manitoba to Nova Scotia was the Red-backed Cutworm (*Carneades ochrogaster*, Gn.). The poisoned bran remedy has almost invariably given satisfaction to those who have tried it. Unfortunately, some applicants for advice have been so unpractical as to condemn this most useful remedy without trying it. By experiment, I have proved that not only is it of great value in gardens, but it may be used advantageously even in field practice. When cutworms are sufficiently abundant to cause wholesale destruction, they, as a rule, assume the habit of army worms, moving in large numbers from place to place as food becomes scarce, and it is frequently possible to head them off from further progress by scattering poisoned bait in front of the army.

Root Maggots (*Anthomyia*).—As is the case every year in some localities, cabbages, cauliflowers, radishes and onions have suffered much from these troublesome insects. They were decidedly more abundant than usual in some places in western Assiniboia and around Calgary, in Alberta, and also on the coast of British Columbia. Mr. Dashwood-Jones reports the Cabbage Maggot as abundant in the roots of cabbages of all kinds by May 15. At Ottawa, radishes and onions were being killed by the middle of June, and cauliflowers and cabbages by the end of the same month. Disks of tarred paper, slit from the margin to the centre and placed around the stems of cabbages at the surface of the ground at the time of planting, gave excellent results; and plants treated by sprinkling a little sand impregnated with carbolic acid mixtures were protected in a large measure. Dusting hellebore along rows of radishes from the time they appeared above ground, once a week, also rendered them to a large measure free from the maggots. Kainit and nitrate of soda had little effect on radishes, but were very useful on all kinds of cabbages by inducing quickly a strong and vigorous root growth. The small staphylinid beetle *Aleochara nitida*, Grav., which is certainly a true parasite on these maggots, occurred in large numbers on some sandy lands at

Ottawa, and by the end of the season hardly any maggots or pupæ could be found in a place where they are usually very numerous. Another parasite also occurred with the above, but in smaller numbers, namely, *Eucoila anthomyiæ*, Ashm., a small black four-winged proctotrypid fly.

THE ASPARAGUS BEETLE (*Crioceris asparagi*, L.)—This beetle and The 12-spotted Asparagus beetle, which have been mentioned in my last two reports as occurring commonly in the Niagara peninsula, have this year spread farther through the country. Prof. Lochhead found both species at Guelph, Ont., and noted that the 12-spotted species was the more abundant of the two. They were not noticed until the middle of August and they did no appreciable damage to crops. The Asparagus Rust (*Puccinia asparagi*, DC.) was reported from three or four places and was particularly injurious on some two-year old plants grown from seed at Ottawa. Mr. J. A. Balkwill reports that there was hardly any at London, Ont., in 1900, but that it increased to a marked degree last summer.

THE ZEBRA CATERPILLAR (*Mamestra picta*, Harris).—The autumn brood of this caterpillar was remarkably abundant at Ottawa during September and October last, and caused considerable damage in gardens to many kinds of plants. The caterpillars were also destructive in fields of fodder rape and turnips. Clover and lucerne were also attacked, but the growth of these crops was so heavy that the loss was seldom noticed. In gardens, cabbages suffered a great deal, and, although they did probably little harm at the time of year they occurred, the caterpillars were extremely numerous on beets and asparagus. In the flower garden the greatest loss was in late flowering Gladioli. The eggs are laid in clusters of about 150. At first the caterpillars are gregarious in habit, and many spikes of flower buds would be destroyed by a brood of caterpillars before their presence was detected. When half-grown, these caterpillars separate and wander in all directions, attacking almost all kinds of vegetation. The full grown caterpillars are very conspicuous and very gaily coloured. They are two inches long, velvety black on the back, with two golden yellow stripes connected by narrow white wavy lines along the sides. The head and legs are bright reddish brown. When full grown these caterpillars spin slight cocoons just beneath the surface of the ground, and the moths fly in the spring and in August. They are rather dull-coloured, purplish-brown moths with white underwings and expand about 1½ inches across the opened wings.

THE SQUASH BUG (*Anasa tristis*, DeG.), known locally as 'Bishop Bug' in western Ontario.—This troublesome and destructive insect was the cause of frequent complaints in western Ontario, from growers of all kinds of plants belonging to the Gourd family, such as squashes, melons and cucumbers. Mr. J. B. Spurr, of Toronto, a large grower of melons, who suffered considerably, reports, August 23 : 'Squashes are very scarce on the Toronto market on account of the prevalence of the Squash Bug this year.' He made the interesting observation that on his grounds, when plants were attacked by the Squash Bug, they were not injured by the Striped Cucumber Beetle, and also that, when plants were attacked by the latter, they escaped the injury from the Squash Bug. This bug is very rare indeed at Ottawa. Twenty years ago, two specimens were taken here by Mr. W. H. Harrington, and none were seen since, although looked for carefully, until the past season, when a few specimens were taken. At Montreal Mr. M. Waring Davis reports considerable injury from the insect this year. Prof. Lochhead writes : 'These bugs were decidedly injurious in most localities throughout western Ontario. All the old well-known remedies seem to have failed altogether in keeping them in check. In the College garden it was decided to keep a watchful eye over the early Squash Bugs ; but, in spite of great care exercised in hand-picking and spraying, they seemed to increase.'

Remedies.—There is still need of a better remedy than those usually advised to prevent loss from the Squash Bug. In seasons of ordinary occurrence, hand-picking

and trapping can be used to good effect ; but, when the insects are in very large numbers, as was the case in some places last summer, all remedies seemed insufficient. The usual remedies are :

(1.) Hand-picking, early in the season, of the old bugs, when they first resort to the plants, and also of the easily seen egg clusters. This requires an inspection of the vines every day or two. The young bugs may be easily destroyed with a spray of kerosene emulsion, or of whale-oil soap. This work is made much easier if a few hills of the ordinary squash are planted among melons, cucumbers, &c., so that they appear above the ground about a week before the crop. The squashes being more attractive, the bugs collect upon them, where they may be destroyed easily.

(2.) Trapping.—This consists of placing, at intervals through the plantation, shingles or pieces of board, beneath which the bugs gather for shelter. By examining these every morning, many may be captured. In a season when the bugs have been abundant, all vines should be burnt as soon as the crop has been gathered. In this way, many of the insects in all stages of development will be destroyed.

THE STRIPED CUCUMBER BEETLE (*Diabrotica vittata,* Fab.).—The injuries to cucumbers and melons by the Striped Cucumber Beetle during the past season were exceptionally severe and extended over the greater part of old Canada. Mr. S. C. Parker, of Berwick, N.S., speaks of it as particularly troublesome in Nova Scotia. At Berwick very few squash or pumpkins survived. In his own case, he planted squashes and cucumbers three times, the first two plantings being eaten up entirely. Frequent mention of injury by this beetle is also made in the Nova Scotia Crop Report for November. The most apparent injury is that done by the hibernating brood of beetles which attack young plants early in the season, and a little later the flowers, as soon as they open. The larva is subterranean in habit. It is a slender, wormlike creature, white, with a dark head, which attacks the roots and bores inside the stems.

As with the Squash Bug, a perfectly satisfactory remedy has not been so far discovered. The treatment of the larvæ in the ground has proved impracticable, except on a small scale. The greatest success has been obtained by covering the young plants with a square of cheese cloth, kept raised by two flexible sticks crossed at right angles and with the ends stuck in the ground. The cheese cloth is held down easily by putting some earth on the edges. By the time the plants have grown so as to require the removal of the covering, many of the first brood of the beetle will have disappeared. As an insecticide, Paris green with land plaster (1 pound to 50) dusted over the plants has proved more effective than several others which have been recommended ; but when the insects are in very large numbers, the plants are gradually eaten up, although large numbers of the beetles are destroyed. Other remedies which have given satisfaction in years when there was not excessive abundance of the beetles, are land plaster or ashes impregnated with coal oil or turpentine, scattered in small quantities on each hill. Tobacco dust from cigar factories, when obtainable, acts as a repellant to the beetles and also as a fertilizer. Pyrethrum powder is deadly to the beetles, but requires frequent renewal.

POTATO PESTS.

The potato crop has been very uneven ; and good crops were exceptional. Small crops were, I think, chiefly due to climatic conditions. In some parts of British Columbia, as down the Okanagan valley, many plants in a field would turn yellow and wither without any apparent cause, which would account for the death of the plants. The tubers in most cases were small but free from disease, and the leaves and stems showed none of the well-known fungous diseases. The hot, dry weather of

midsummer in eastern Canada was credited with a considerable shortage in the crop, but in some parts of western Ontario it is particularly noted that the potatoes put in late have yielded well.

The Colorado Potato Beetle has been very destructive in many places and was particularly abundant in Nova Scotia and Prince Edward Island, where the potatoes were not sprayed with Paris green or other poison. In Manitoba and the North-west Territories at a few points some injury was done by the Black Blister-beetle (*Epicauta Pennsylvanica,* DeG.). As is usually the case, however, the visitations were of short duration. I was informed by the Hon. R. P. Roblin of one instance in which a considerable swarm of these beetles on a neighbour's farm was cleared from a potato patch by a flock of 25 or 30 chickens. No ill effects to the chickens were noticed, which seems somewhat surprising. The Black Blister-beetles were abundant on potato patches in the city of Winnipeg and were attracting much notice during the first week of July, but had all disappeared before the middle of the month.

THE STRIPED BLISTER-BEETLE (*Epicauta vittata,* Fab.).—Another beetle which this year has shown up far more abundantly than is usually the case is the Striped Blister-beetle, of which specimens have been sent in from a few places in western Ontario, as injurious to potatoes, tomatoes, mangels and beets.

Fig. 9.—The Striped Blister-beetle.

'Queenston, Ont., July 20.—I send you some striped beetles from a neighbouring farm. They are destroying tomatoes, potatoes, &c. These insects are very wary, and are gregarious in habit.'—W. O. BURGESS.

'Cedar Springs, Ont., July 21.—I send specimens of a kind of beetle which is destroying my mangels. They come in swarms and eat the leaves. There are beets in the same patch, but they have not touched them yet. Do you think they will?'—WM. CLAYTON, Sr.

'Stromness, Ont., Aug. 10.—Please find inclosed beetles that are eating up beets, potatoes and tomatoes. They are in gardens in swarms, and you can drive them like sheep. They are voracious eaters, and have nearly destroyed our beets. We sprayed them with Paris green, and it appears to have killed them. What are they ? I never noticed them until this summer. Please give me some information on the subject.'—HENRY E. DICKOUT.

The Striped Blister-beetle is a narrow, soft-bodied beetle about half an inch in length, with blackish wing-cases, each of which is margined with yellow and has a yellow stripe down the centre. The head and thorax are also dark, with yellow markings. The legs are long and slender, and the beetles are, as mentioned above, extremely active, flying readily from their food plant when approached. This habit is of much use in preventing these Striped Blister-beetles from destroying crops.

Like all the rest of its family, this species, in the larval form, is a predaceous parasite on the eggs of grasshoppers. It is, therefore, undesirable to destroy the beetles if this can be avoided. As is the case with nearly all leaf-eating insects, this one can be destroyed by spraying the crops with a poisonous mixture, such as Paris green and other arsenites. Prof. Webster found that Bordeaux mixture sprayed over plants kept these beetles away, and that they could be readily killed if whale-oil soap were sprayed on them. Owing, however, to the readiness with which they take flight when approached, an operation known by the name of 'driving' has been adopted in those parts of the United States where this species occurs, and where it is far more abundant than has ever been the case in Canada. In my experience, this insect has been very seldom mentioned as a crop pest in the Dominion, and it is worthy of remark that considerable injury was done by grasshoppers to crops in that part of Ontario, from which the above reports were received. 'Driving' consists simply of several people walking across an infested field with branches, or other conspicuous objects in their hands, waving them from side to side and driving these easily disturbed beetles ahead of them until they come to the edge of the crop, where they will disperse and seldom return. A character which is often noticed with these beetles is that they appear in large numbers suddenly, which is due to the fact that the larvæ

do not feed on vegetation, and the beetles, when mature, fly to the fields in swarms to feed. The crops which are most generally attacked are mangels and beets, but tomatoes and potatoes are also attacked. A satisfactory feature, too, is that a swarm seldom remains for any considerable length of time in any one field.

THE CUCUMBER FLEA-BEETLE (*Epitrix cucumeris*, Harr.).—This minute beetle, which does not exceed one-twentieth of an inch in length, is black, covered with short fuscous hairs, and is much more frequently complained of as a potato pest than as an enemy to any other crop. It is sometimes, in hot dry summers, one of the worst enemies of the potato, eating many small holes through the leaves and reducing them so much that they are unable to perform their functions. Reports of injury have been received from Vancouver Island and several places in Ontario. The best remedy for this insect appears to be spraying the vines with Bordeaux mixture. This treatment has given far better results than spraying with Paris green. The practice, too, of spraying potatoes with Bordeaux mixture is also an excellent one, as being an effective preventive of the Early Blight of the Potato, as well as of the much more destructive Potato Rot or Late Blight.

THE FIVE-SPOTTED HAWK-MOTH (*Protoparce celeus*, Hbn.).—The large caterpillar of this moth, known as the Tomato Sphinx, is frequently found in some numbers upon tomato vines, but its work is so conspicuous and the tomato makes such rapid growth that its injuries are very seldom important in Canada. However, the caterpillar feeds on many other plants belonging to the Nightshade Family, such as the potato and tobacco. It is frequently the cause of considerable loss in the large tobacco fields in the county of Essex, where it is generally spoken of as the Tobacco Worm. This name, however, belongs properly to an allied species, *Protoparce carolina*, Linn., which occurs very rarely in Canada. Prof. Lochhead, of Guelph, writes : 'The Tomato Sphinx was very abundant in 1901 on tomatoes, potatoes and tobacco. In fact, it was no trouble to gather hundreds of specimens of the large worm in a few hours.' During the past summer some reports were received from western Ontario of injury to potatoes by the caterpillars of the Five Spotted Hawk-moth. The potato, however, must be considered an exceptional food plant and the insect is not likely to become a regular pest of that crop.

THE POTATO-STALK WEEVIL (*Trichobaris trinotata*, Say).

During the past summer, another insect has been added to our Canadian list of crop pests. Prof. Lochhead writes to me as follows :—

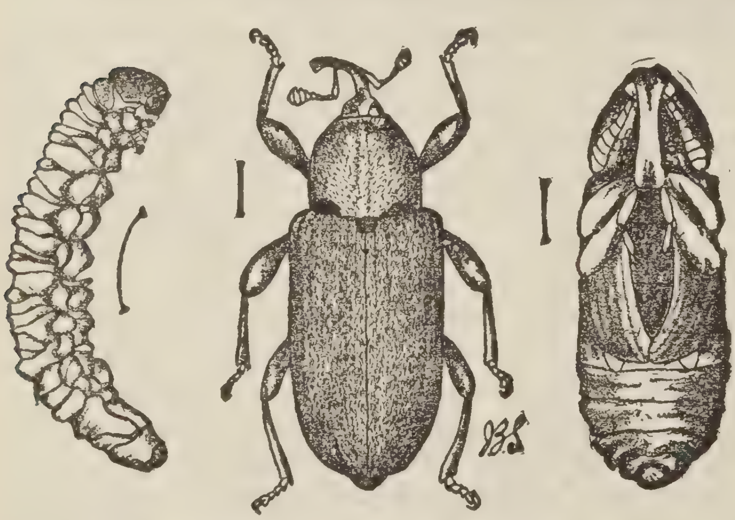


Fig. 10.—The Potato-stalk Weevil : larva, pupa and beetle—enlarged. (Kindly lent by Dr. J. B. Smith.)

'In September I received from Mr. J. A. Auld, M.P.P. for South Essex, specimens of potato vines which were completely destroyed by the Potato-stalk Weevil, and he reported that this insect was very prevalent in Pelee Island. Last year, he said, the island exported 30,000 bushels of potatoes, but this year it will have no more than enough for itself, and none to spare. It is almost impossible to tell the presence of the insect in the vines until they commence to wither and die. The vines sent me were badly tunnelled, and in some of them were found grub, pupa and adult.'

The Potato-stalk Weevil is a small, slaty-gray, oval beetle about ¼ inch long, with a black head and beak. There are also three distinct black spots across the shoulders. The injury is done by the grubs, of which from one to five may be found during July and August in the stems of infested potatoes, the centre of which they have eaten out. The oval white eggs are laid by the females in slits which they make with their beaks in the base of the stem. The eggs soon hatch, and by about the middle of August the soft, yellowish white, legless and wrinkled grubs with brown, horny heads are full grown. These, like most weevil larvæ, lie in the stem in a curved position. Where there are several of these grubs, most of the central part of the stem is eaten, the leaves turn yellow and the stem dies prematurely ; but, when only a single larva occurs, little harm is done. When full grown, the grubs usually work their way down to the base of the stalk and form white cocoons of fibres gnawed from the stem. The pupa state is of short duration. The beetles mature in August and September, but they pass the winter in the cocoons, and do not emerge until the following spring.

Fig. 11.—Potato vines eaten out by the Potato-stalk Weevil—somewhat reduced. (Kindly lent by Dr. J. B. Smith.)

The Potato-stalk Weevil has never before been recorded from Canada as a serious enemy, but in several of the United States it has occurred intermittently, and has done much harm for a year or two and then suddenly disappeared. It was treated of by Dr. Thaddeus Harris fifty years ago as a potato pest in Pennsylvania. Since that time several of our American practical entomologists have mentioned it in their writings.

Remedy.—From the fact that the perfect beetle passes the winter in the dead stems of the plants it has attacked during the summer, an easy and effective remedy is to destroy all vines as soon as they are seen to be infested or as soon as the potatoes are dug up. The advantage of promptly destroying with fire all haulms, tops, vines, &c., of such crops as have been taken in, cannot be too strongly advised. Not only is untidy or objectionable litter thus removed and turned into useful fertilizing elements, but many injurious insects and fungous diseases are done away with, which would endanger the crop of the following year. This is particularly the case with the potato, the most destructive disease of which, the Potato Rot, propagates in the leaves

and stems which are frequently left lying about the field after the crop is dug or are piled on the top of the tubers before these are bagged.

As far as is known, this beetle feeds only on plants of the Nightshade Family, which is sparsely represented both in our native and cultivated flora. Wild plants of the thorn-apples, *Datura Stramonium,* and *D. Tatula,* as well as the wild Solanums should also all be destroyed whenever they are found growing near crops of potatoes in a district where the Potato-stalk Weevil has appeared. Prof. J. B. Smith recommends that, if the presence of the larvæ is noticed in the fields, the plants should be stimulated by the application of appropriate readily soluble fertilizers, so that the vines may be able to mature the crop despite the attacks of the weevil.

THE VARIABLE CUTWORM (*Mamestra atlantica,* Grt.).

For the last three years the moths of this species have been extremely abundant at Ottawa ; and at other points in Ontario and Quebec their abundance has been noted by collectors of insects. During the past summer this moth was one of the commonest species at Ottawa around electric lights. As it is only of late years that the insect has become prevalent in the Ottawa district, and in view of the remarkable increase in its numbers, it seems not improbable that it may at some time develop into a pest of some importance. Occasional specimens of the caterpillars have been found in vegetable gardens, but as yet no reports have been received of their having done harm to any cultivated crop.

During the past season a cluster of eggs of this moth was found upon the European Honeysuckle (*Lonicera caprifolium,* L.), and the larvæ were reared to maturity and notes taken on all the stages. The larvæ were fed to various low plants, chiefly plantain, dandelion, &c., and passed through seven stages before entering the earth to pupate. The eggs were found on June 6 and had probably been laid two or three days, the first caterpillar hatched June 10, and the perfect moth emerged July 17—a life period of 37 days.

As to whether there is more than one brood in the year, is a question which requires further light. From the data at hand it is just possible that there are two broods at Ottawa. Moths have been taken as early as May 22, and from that date commonly until June 28, then again from July 31 to August 25. Those reared from eggs during the past summer emerged from July 17 until August 1. A nearly full grown caterpillar was found on October 19 in the earth, near a row of beet-roots, apparently hibernating, about an inch below the surface. On the day previous to this, another specimen which was parasitized was found in the same place on the Experimental Farm. Many of the brood of caterpillars reared from the egg, which pupated in July, are hibernating in the chrysalis state. Mr. C. H. Young, of Hurdman's Bridge, near Ottawa, also found out of doors in the fall of 1900 a pupa which gave the moth the following spring. It may be, therefore, that there are two broods of this insect in the year, namely, as follows : those which emerge in spring in May and June, either from wintered pupæ, or from larvæ which have hibernated nearly full grown and then pupated early in spring, and those which emerge in late July and during August, being from eggs laid by the moths of May and June, as in the case of those reared the present summer. The larvæ found in October are doubtless from eggs laid by the moths which fly in late July or in August. The second brood, however, may, as in the case of those reared this year, be only a partial brood, as about half of those reared emerged from July 17-August 1, the remainder wintering over as pupæ. It is possible too that the larvæ reared in confinement this year inside a building and during unprecedentedly hot weather may have emerged sooner than was natural.

The general appearance of these caterpillars may be described as follows :—The ground colour of the body which varies remarkably in different specimens of the same brood, ranges from yellowish-green, through a dull yellow ochre, a ruddy brown, to a dark umber brown. The markings may be described as minute mottlings, dots and

streaks aggregated on the dorsal area into a regular pattern consisting of a medio-dorsal continuous band, with a pale disconnected narrow line in the centre, and two lateral less connected stripes also centred with a pale thread and of about the same intensity as the medio-dorsal band. The space between the lateral stripes is closely speckled with black dots. The stigmatal stripe is black, narrow and distinct, and close beneath it is a wide conspicuous yellow substigmatal band with the ground colour showing through it in places. The ventral surface is slightly paler than the dorsal. The head is honey yellow, mottled with darker markings.

The caterpillars of *Mamestra atlantica* being cutworms, if they should ever become abundant, the ordinary remedies for cutworms may be used.

The moth of *Mamestra atlantica*, Grt., is a pretty grayish brown species with the fore wings mottled with darker brown blotches and shaded with ruddy brown or gray. The costal area which reaches to and includes the orbicular spot is distinctly grayish, the lower wings fuscous. The subterminal line which bears the W-shaped mark of the genus is white and narrow, very distinct, by reason of a dark shade between it and the margin. Superficially *M. atlantica* will be thought by the ordinary observer to bear a decided resemblance to *M. subjuncta,* G. & R. Prof. J. B. Smith has very kindly drawn me up the following memorandum describing the differences between *M. atlantica,* the closely allied *M. nevadæ,* Grt., and *M. subjuncta.* In addition to what Prof. Smith has noted, I may add that, from the examination of a large number of specimens caught in the field and several others reared from the egg in confinement, I find a very constant difference in the form of the subterminal line. In *subjuncta* this line sweeps in a gentle curve behind the apical patch and coming forward joins the base of the W-shaped mark, whereas in *atlantica* it strikes inward from the costa behind the apical patch in a straight line and then runs out again at a sharp angle beneath it. The apical patch in *subjuncta* is hardly traceable, while in *atlantica* in many specimens it is strikingly paler than the rest of the wing around it.

Notes on Mamestra atlantica, Grt., *M. nevadæ,* Grt., *and M. subjuncta,* G. & R.

Mamestra subjuncta differs at once from *atlantica* and *nevadæ* by the longer, narrower primaries, in which the anal angle is distinctly retracted. In ornamentation the obvious difference is a narrow black line extending from the end of the claviform to the t. p. (transverse posterior) line in *subjuncta,* which is wanting in both the others.

As between *atlantica* and *nevadæ,* the differences are equally great in general appearance, but more difficult to locate and define.

Atlantica is somewhat smaller, much brighter in colour, the costal region tends to become lighter throughout and the transverse lines obscure. The orbicular is oblique, narrow, elongate, the claviform narrow and pointed at tip. There is no suggestion of *subjuncta* in appearance.

Nevadæ has an obvious resemblance to *subjuncta* and hardly recalls *atlantica.* The colour is darker, the costal region is not contrastingly brighter, the orbicular is round or oval, and the claviform is short, broad and not pointed. The male organs differ markedly. See Proc. U.S.N.M. xiv., pl. viii. ff. 20 and 23 for *atlantica* and *subjuncta.* Those of *nevadæ* exaggerate the *atlantica* characters.—John B. Smith.

FRUIT CROPS.

The fruit crop of Ontario during the past season has been a very remarkable one. For the greater part of the province apples may be said to have been a failure, but in the northern counties and up through Muskoka, Manitoulin and Algoma, wherever

apples are grown, excellent crops were reaped. Plums and pears have been full crops, although the former were considerably injured in some places by aphis. In western Ontario sweet cherries were very short and the trees suffered greatly from the Black Aphis. Mr. W. S. Blair tells me that this was also the case in Nova Scotia. After the San José Scale, probably the worst enemies of the fruit grower in Ontario this year were the Cankerworms. Prof. Lochhead reports that the Cigar Case-bearer is becoming more serious every year, which he believes is due to early spraying not being attended to.

In the province of Quebec the crop was rather light, but the quality of the fruit was good and realized high prices ; this was markedly the case where attention had been given to spraying, Mr. R. W. Shepherd, of Como, a large buyer of choice apples for the British market stating unequivocally that he could only obtain first-class fruit fit for the above purpose from orchards which had been regularly sprayed.

In Nova Scotia the crop has, on the whole, been a very satisfactory one. Fruit was of good quality and the prices remunerative. Prof. Sears of the Nova Scotia School of Horticulture, says :—'The apple crop was peculiar. Perhaps never before has a finer, fairer crop of fruit been produced, but while one section is blessed with a remarkably abundant crop, another, not more than four or five miles distant, is a very light one ; doubtless, methods of culture, spraying and fertilizing are to a large extent responsible for this.'

In British Columbia the fruit crop has been a satisfactory one. Plums were abundant and there was not much complaint of disease. Apples were a heavy crop in some places but light in a few others. The quality was excellent and higher prices than usual were secured. The markets in the Kootenays, North-west Territories and Manitoba have been opened up and car-load shipments have been going forward since the beginning of the season. Mr. R. M. Palmer anticipates that there will be a very largely increased acreage in fruit next year. There was no very serious injury reported to fruits in British Columbia. Strawberry beds near New Westminster and around Burnaby were to some extent injured by the larvæ of the Black Vine Weevil (*Otiorhynchus sulcatus*, Fab.). The Imported Currant Borer (*Sesia tipuliformis*, Linn.) is reported by Mr. W. A. Dashwood-Jones as very bad this year all over New Westminster city. Another enemy which is injuriously prevalent in Vancouver Island and at the mouth of the Fraser river is the Currant Maggot (*Epochra canadensis*, Loew.). This insect attacks all kinds of currants and sometimes gooseberries. During the past summer it also occurred in noticeable numbers at Edmonton, Alta., Winnipeg, Man., and one or two places in Nova Scotia. Plant-lice were troublesome on apple and plum trees in British Columbia.

As is the case every year, many of the well known pests of the orchard have levied a heavy tribute in some localities, particularly where spraying and cultivation have been neglected.

THE CODLING MOTH (*Carpocapsa pomonella*, L.—Mr. Linus Woolverton, Secretary of the Fruit-Growers' Association of Ontario, writes that 'the Codling Moth is still the terror of the apple-growers. It is a most serious enemy, and, if you can give us any later information with regard to the best method of destroying it we should be very glad.' Mr. Parker, Secretary of the Fruit-Growers' Association of Nova Scotia, and Rev. Father Burke, of Alberton, P.E.I., both write in very much the same strain ; but the two last correspondents also drew attention to good results where spraying has been carefully attended to. Where there is only one brood of this insect, as in eastern Ontario and from there to the seaboard, spraying after the blossoms have all fallen and the young apples have begun to form is undoubtedly the best remedy. Two sprayings, at least a fortnight apart, should be given. In western Ontario this must be supplemented with banding the trees from the middle of June. Burlap is the best material to use for the bands, and careful search must be made beneath them at short intervals to destroy the cocoons. These are sometimes rather difficult to detect as the larvæ burrow down somewhat into the surface of the bark and cover the cocoons with

the debris. The Hazeltine moth trap, so much advertised, has not given good results.

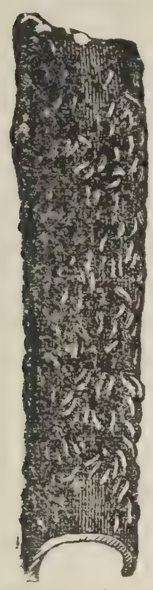


Fig. 12.—Twig infested with Oyster-shell Bark-louse.

THE OYSTER-SHELL BARK-LOUSE (*Mytilaspis pomorum*, Bouché, = *M. ulmi*, L.) is still a persistent enemy in all parts of the country, and attacks many kinds of trees and shrubs. The remedy is spraying when the young emerge in the first week of June in Ontario, and as late as the third weeek in June in the Maritime Provinces, with kerosene emulsion or whale-oil soap. Spraying infested trees with a wash made by dissolving 1 lb. of concentrated lye in from 3 to 6 gallons of water, which is frequently recommended, has not given me satisfactory results in controlling the Oyster-shell Bark-louse. Mr. Macoun, the Horticulturist of the Central Experimental Farm, has been very successful in clearing the apple orchard at Ottawa from this troublesome pest by spraying with a lime wash and at the same time giving high cultivation to maintain the fertility of the soil and invigorate the trees. He sprayed the trees in autumn or early in winter with a whitewash made with one or two pounds of fresh lime to each gallon of water. As soon as the first coat had dried, a second one was applied. During the winter the lime flakes off the bark and carries with it the scales which have previously been loosened by this alkaline application

CANKERWORMS (*Anisopteryx*).—These caterpillars have been very destructive in western Ontario in 1901. Mr. George E. Fisher considers them among the worst pests of the season. Mr. Woolverton speaks of them in the same terms. Orchards have also been defoliated in Quebec and Nova Scotia. The remedies for these insects are early spraying, just after the blossoms have all fallen, and banding threatened trees in autumn and spring, with one of the mechanical tree protectors or with adhesive mixtures, either directly on the trees or on bands of coarse paper tacked closely and firmly around the trunk. For spraying, 1 lb. Paris green, 1 lb. fresh lime and 160 gallons of water will answer, and, if applied while the young caterpillars are small, will destroy them surely. The method of applying the adhesive mixture is explained fully in my report for 1895. The best mixtures are (1) printers' ink, 5 lbs. and fish oil, 1 gallon, which will treat about one acre of orchard. (2) *a*. For cold weather, castor oil, 2 lbs., common resin, 3 lbs. *b*. For warm weather, castor oil, 2 lbs., resin, 4 lbs. Heat slowly until the resin is all melted and apply warm. (Mr. O. T. Springer's receipt.) Mr. George E. Fisher, of Freeman, uses practically the same materials but prepares them rather differently. He says : 'For use against the Cankerworm in warm weather I use castor oil and resin (5 lbs. of resin and 3 lbs. of castor oil, and in cold weather, equal parts of all by weight). A little experience is necessary to determine just what proportions will suit the prevailing weather conditions, but they will vary between these limits. The rough bark should be carefully removed at a convenient height before applying the mixture. The first application will not remain sticky very long, being appar-

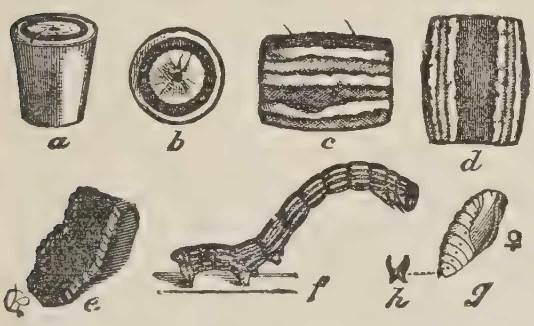


Fig. 13.—The Fall Cankerworm ; *a*, egg ; *b*, end view of egg ; *e*, mass of eggs ; *f*, caterpillar ; *c*, *d*, segments of *f* ; *g*, pupa of female—*a*, *b*, *c*, *d*, enlarged.

Fig. 14.—The Fall Cankerworm ; *a*, male moth ; *b*, female moth ; *c*, joints of antenna of *b* ; *d*, abdominal segment of *b* ; —*c* and *d*, enlarged.

ently absorbed by the bark, and a second may be necessary in about a week. This will keep fresh a good while, and is certainly a good trap for Cankerworms in either the moth or caterpillar stage. We have taken as many as 250 females on a single small plum tree. The cost of this sticky bandage and of putting it on several times amounts to a considerable sum, where many trees are involved. I am thinking of trying a collar made of tar paper.'

TENT CATERPILLARS (*Clisiocampa*).—Nearly all correspondents, except those from south-western Ontario, report a conspicuous absence during the past summer of Tent Caterpillars. Considerable harm, however, was done in the Niagara Peninsula, and along the north of Lake Erie. Mr. L. Woolverton writes : 'The Forest Tent Caterpillar is committing great ravages in orchards bordering upon woods. They come in great numbers from native trees to the orchards, and are very destructive and difficult to check.' When upon orchard trees, spraying with the ordinary Paris green mixture is the best remedy for Tent Caterpillars, but, at the time they spread from woodlands to adjoining orchards, they are as a rule nearly full grown. In this case, mechanical tree protectors or loose bands of cotton batting will probably be the most satisfactory way of keeping them off the trees.

APPLE-TREE BORERS (*Chrysobothris femorata*, Fab., and *Saperda candida*, Fab.).—The recognized methods of fighting these enemies of the apple-grower, are the application of washes to the trees to prevent the females from laying their eggs, and the digging out of the larvæ in the autumn and spring, when indications of their presence are observed. Although both of these old remedies are good ones, and in many instances all that are required, there are occasionally found localities where these insects are in such numbers that some other and better remedy is still a desideratum. Mr. Francis S. Wallbridge, of Belleville, Ont., has an orchard which is situated in one of these localities where the borers seemed to defy all efforts to control them. The orchard is a young one, has received every care, and many experiments have been tried to clear it of these insects, but with little effect. It seems, therefore, necessary to try more experiments before we can claim to have a practical remedy against Apple-tree Borers. I shall be obliged if fruit-growers living in the districts infested by the San José scale will report to me whether whale-oil soap and crude petroleum, now used to a considerable extent on apple trees for the destruction of the San José Scale, do not also prevent attack from the Apple-tree Borers. A series of experiments has been planned with various mixtures containing carbolic acid, which will be reported on later. Fig. 15 shows the Flat-headed Apple-tree Borer (*C. femorata*) twice the size of nature.

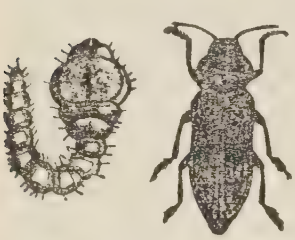


Fig. 15.—The Flat-headed Apple-tree Borer : larva and beetle—enlarged.

THE ROSE CHAFER (*Macrodactylus subspinosus*, Fab.).—This troublesome beetle, which every year does so much harm to the flowers of grape vines and to young apples, has this year been rather abundant in the Niagara district, attacking apples and peaches. Mr. H. Gordon Ball, when sending specimens, at the end of June, wrote : 'I think that in one peach orchard they have destroyed from 15 to 20 per cent of the fruit, and this year the trees require all the peaches that form to make a good crop. These beetles do not seem to eat the leaves or anything but the fruit. A wild-grape vine along the fence seemed to be alive with them. The beetles fly around the trees readily, but, when touched, they are more apt to fall to the ground than fly. Many of the peaches, when bitten by the beetles, fall off.' As has been frequently observed, the Rose Chafer is an extremely difficult insect to destroy with poisons, and a satisfactory remedy has long been wanted. Although very active during the hot hours of the day, the beetles are sluggish early in the morning, and are fond of congregating in numbers on trees upon which they feed. Many may, therefore, be

Fig. 16.—The Rose Chafer —life size.

destroyed by beating these trees over a collecting net or an inverted umbrella, to be afterwards emptied into some vessel containing water, with a little coal oil on the surface. The beetles seem to be particularly fond of certain varieties of grapes, as for instance the Clinton. When this is known, the usefulness of planting a few vines of this variety in a vineyard as a trap is apparent. These will act as decoys upon which the beetles will collect and from which they may be easily beaten and destroyed. The rose tree, in all of its varieties, and the blossom of the rhubard are also very attractive, and may be planted so as to draw off the attack from fruit trees. Prof. Webster has made the discovery (Proc. Ass'n Econ. Ent. 1899, p. 70) that 95 per cent of the adult beetles may be killed by spraying them with half a pound of fish-oil soap in a gallon of water. The suds must be thrown directly on to the beetles while they are clustered on the blossoms of the decoy plants, but spraying trees with the soap has no effect in keeping the beetles off afterwards.

Among less known injuries to fruit crops which have been reported during the past season, mention may be made of the following :—

Click Beetles (*Elateridæ*).—The food habits of these beetles are somewhat various. Although, as they are the perfect state of wireworms, which are so destructive to all classes of vegetation, they must be considered among the worst of injurious insects, yet they have been occasionally caught in the act of feeding on plant-lice. Many kinds of Click Beetles are found on flowers, and complaints of extensive injury to apple and pear blossoms have been received concerning two species, namely, *Corymbites tarsalis,* Melsh., and *C. caricinus,* Germ. During the past summer specimens were received from Mr. M. Young, of Gardenville, Ont., of another species not previously recorded as a fruit enemy, i.e., *Corymbites cylindriformis,* Hbst., with statement that they had bitten plums, apples and other fruits. Mr. C. W. Nash, of Toronto, also forwarded specimens of the same species for name, which had been sent to him as depredators on the flowers of apples.

The Blackberry Soft-scale (*Lecanium Fitchii,* Sign.).—A remarkable outbreak of this scale insect occurred at Trenton, Ont., ample specimens of which were sent to me by Mr. John D. Evans, who stated that about eight acres of blackberries in different orchards were covered with the scales from about a foot above the ground to the top, and that the injury was chiefly on old plantations, probably ten or twelve years old. A young plantation at some little distance was very little affected. The examination, later in the season, of the material received from Mr. Evans revealed the fact that the scale insects were severely infested by parasites : A fungus, a species of *Cordyceps,* two species of small lady-bird beetles, *Hyperaspis proba,* Say, and *H. signata,* Oliv., and no less than six species of hymenoptera, *Encyrtus fuscus,* Howard, *Aphycus annulipes,* Ashm., *Coccophagus flavoscutellum,* Ashm., *Blastothrix* sp., and *Microterys* sp., all in large numbers, and, as well as these, a single specimen of a very interesting minute Proctotrypid *Eutochus xanthothorax,* Ashm., of which Mr. Ashmead, when kindly naming the above specimens, says : 'A Mymarid described fifteen years ago from Florida. (Can. Ent. XIX., 1887, p. 193.) This is the second specimen seen.' Nearly all of the same parasites were reared in equally large numbers by Mr. Evans from part of the same material collected at Trenton.

The Plum Gall-mite (*Cecidoptes pruni,* Am.).—A very unusual but rather serious injury was discovered last winter by Mr. Geo. E. Fisher, at Queenston, Ont. This was due to the small mite named above. Mr. Fisher says : 'The galls are plentiful in this one orchard at Queenston. I have not noticed them anywhere else.' In June last, Mr. Carl E. Fisher, of Dulverton, Queenston, also sent specimens, reporting that it occurred only on one of his own trees, but that he had seen it frequently on Common Blue and Red Egg plums in Queenston village. He feared that it might become a serious disease. In Europe this mite occasionally becomes a pest of some importance.

The small, shot-like galls are produced on young twigs, usually on old trees, but they have also been observed by Dr. L. Kirchner on young and healthy plants, whose death they caused. (Andrew Murray, Aptera, p. 363.)

The Peach Bark-beetle (*Phlœotribus liminaris*, Harr.).—This little bark-beetle although it only occurs in Canada, as far as I am aware, in the Niagara Peninsula, is there every year the cause of much injury to peach trees. Mr. Carl E. Fisher has for several years experimented with remedies and has kept it measurably under control. During the past season he has tried washing the trees with a strong solution of whale-oil soap, and the results are so satisfactory that I have much pleasure in making them public for the benefit of others who are troubled with this pest. Mr. Fisher writes : 'Regarding the Peach Bark-beetle, it is still a bad pest. I can see signs of it in many of the orchards throughout this section. The best remedy I have found yet is three pounds of whale-oil soap in one gallon of water, applied in the early spring, when the beetles first begin to move, and two or three times afterwards, if it is considered necessary from an examination of the tree during the summer. This is much easier made up than the formula I sent you some time ago. (Rept. Ent. and Bot., 1896, p. 225.) It is fully as effective, or more so, and of course will not injure the tree. Applied with a stiff scrubbing brush, the work is easily done.'

THE SAN JOSE SCALE.

The San José Scale is still a subject of enormous importance in that part of Ontario where it occurs. Fortunately, it does not exist in any other province of Canada, and during the past season it has spread but little beyond its former limits, but within these a great deal of harm has been done in many orchards within the area where it has secured a footing. This insect was not detected in Ontario orchards until January, 1897, and certainly was not at that time abundant in any part of the province. All statements that the insect has been in the country for ten or more years are, as far as I can find out, mistakes, or are founded on conjecture. In different localities the degree of injury to trees from this insect varies very much, but in all places, when once established, it spreads rapidly, and by the second year the trees may be coated over by the scales and rendered so unsightly as to be readily detected. Trees in this condition are always seriously injured, and, although with careful treatment they may be saved, it is usually questionable whether this is good policy, and whether it would not be better to cut down the trees and replant.

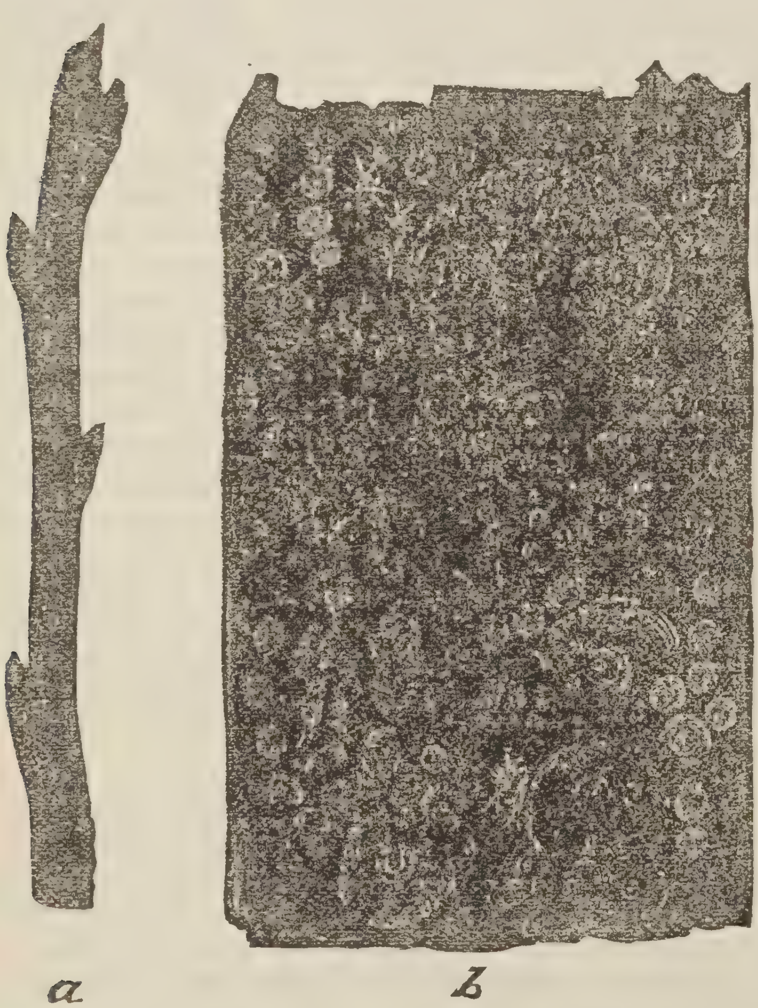


Fig. 17.—The San José Scale : *a*, infested twig ; *b*, part of the same, much enlarged. (Cut kindly lent by the U. S. Entomologist.)

Owing largely to the excellent work which has been done by Mr. George E. Fisher, the Inspector of San José Scale for the province of Ontario, and also by Prof. F. M. Webster, in the State of Ohio, just across our borders, where the conditions are identically the same with ours in Ontario, fruit-growers are at last beginning to appreciate how important a matter it is for them to take measures to control this terrible pest as soon as they become aware of its presence on their trees. The outlook at the present time, as far as the San José Scale is concerned, seems more hopeful than it has ever been since the first announcement of its occurrence in Canada. Every effort has been put forth by the federal and provincial governments to protect fruit-growers and others from further importations of the scale, and at the same time a great deal of work has been done in distributing information through printed reports and bulletins, through addresses at public meetings, and through the agricultural press, to explain to all likely to suffer from the ravages of the insect how to recognize it, what its habits are, and what can be done to keep it in check. Extensive experiments have been tried, particularly by the officials of the Ontario Government, with all the remedies which from time to time have been suggested, and, as an outcome of all the work done in Ontario and the United States, it may now be reasonably claimed that we have three practical remedies against this worst of all known fruit pests, which are, at any rate, as effective against it as many remedies which are used with satisfaction against other injurious insects.

Injurious Nature of the San José Scale.—A vain hope which was entertained by fruit-growers in Ontario, was that all parts of Canada were too far north for the San José Scale to increase and spread to the injurious extent of killing trees. It was known that in the Southern States trees had been killed in two or three years. Some claimed that the scale had certainly been introduced into Canada for several years longer than was believed to be the case by entomologists, and as no trees had been found to have been killed by it, they thought that the danger from this insect had been overestimated by those who had studied it carefully, and that in Canada the scale would not kill trees outright in the same wholesale manner as it did in the Southern States. The experience of the past season, however, in many orchards which I have visited this autumn, at Niagara, St. Catharines, Chatham, and Guilds, near Blenheim, Ont., entirely disposes of any doubt on this score. Several trees were seen which had only been attacked for two or three years, but which were quite dead, and a great many more which, although they had not been actually killed outright, were so seriously injured that they were practically useless. I anticipate that very few of these will survive the winter. The kinds of trees which had been most injured were peach, plum, and pear, in the order mentioned ; even apple trees, which are known to resist the attack of this insect longer than other fruit trees, were found dead in some orchards which had been known to be infested for only two or three years. Others were found very seriously injured, many of the lower branches being quite dead. Some varieties of apples, and indeed of all other fruit, are more susceptible to injury from the San José Scale than other kinds are. The Rhode Island Greening seems to have small power of resistance among the best known commercial varieties of apples, and the fruit shows the presence of the scale much more conspicuously by the red blotches which are caused on the green skin, wherever they have been attacked. Among plums, the Japanese varieties suffer most. 'Of peaches, Crawfords and varieties of that type are the most susceptible. Bartlett pears are probably most affected, and Kieffers certainly least.' (G. E. Fisher.)

Rapidity of Increase.—As an instance of the rapidity with which the San José Scale spreads, I may cite one large orchard, near Chatham, Ont., consisting of 70 acres, containing over 10,000 well-grown fruit trees of various kinds—apple, peach, pear and plum. This orchard has been well pruned, cultivated, sown with cover crops, and otherwise cared for. Two years ago, infested trees were detected at four or five points through the orchard. No efforts were made to destroy the scale, and, when I visited

the place in November last, the insect could be found in every part of the orchard. I have no doubt but that, unless some treatment is given the trees next season, serious loss will ensue. In another orchard of 1,600 peach trees, near Niagara, in August, 1899, seven experienced men spent six days in making a critical examination, and found only 87 slightly infested trees. In the season of 1900, this orchard bore a full crop of fruit, but the scale insect spread through the whole orchard and could be found on every tree. By the beginning of November, 1901, many of the trees were dead, and all practically so for any commercial purposes. This was a direct result of neglect, nothing having been done to rid the trees of their enemy. Many other instances might be given, but they all tell the same tale, that the San José Scale must still be considered, as it has always been claimed to be by entomologists, the pest most of all to be dreaded by fruit-growers. These latter, therefore, as a class, should do everything in their power to back up and help the Government in its wise endeavours to protect the country from further importations from abroad and from allowing the insect to increase in Canadian orchards. Every one can help in this matter, for it cannot be denied that the chief reason that this pest has done so much harm as it has, is because fruit-growers themselves, from not recognizing the gravity of the case, have not helped, or even, in some instances, have opposed the steps taken by the Governments to control it, and, moreover, have not, in their own orchards, applied the remedies which the latest experiments have proved to be the best.

Remedial Measures Taken.—It may not be amiss to recapitulate from my last annual report the restrictions under which, by the amended San José Scale Act, nursery stock may now be imported into Canada from countries where the San José Scale is known to occur. 'When it was discovered that this insect could be killed on nursery stock by fumigating with hydrocyanic acid gas, at the urgent request of many fruit-growers, horticultural societies, nurserymen and others, by instruction of the Minister of Agriculture, proper fumigating houses were erected in the spring of 1899 at such points on the boundary as it was thought would be most convenient to importers, and qualified superintendents were appointed to treat any nursery stock, trees, shrubs and other plants as might be imported through these ports, and then repack and send them on to their destination as promptly as possible. For this purpose, fumigating with hydrocyanic acid gas, using the formula recommended by the United States Entomologist for dormant stock, was adopted, it being the simplest effective formula, viz., one fluid ounce of commercial sulphuric acid, one ounce of refined cyanide of potassium (98 per cent), and three fluid ounces of water, to every 100 feet of cubic space—exposure 45 minutes. These fumigating houses were located at the customs ports of St. John, New Brunswick ; St. Johns, Quebec ; Niagara Falls and Windsor, Ontario ; Winnipeg, Manitoba ; and Vancouver, British Columbia. The whole expense of these stations was assumed by the Dominion Government, but all shipments were made entirely at the risk of the shippers or consignees, the Government assuming no risk whatever. The packages had to be addressed so as to enter Canada at one of the above-named ports of entry, and the route by which they were to be shipped, clearly stated upon each package.

'Many horticulturists and nurserymen availed themselves largely of this concession, and at every point much stock was imported from the United States and Japan. Nursery stock of all kinds can be imported from Europe without fumigation, as the San José Scale has never gained a foothold in European countries. Certain other plants which are not liable to the attack of the San José Scale are also exempted from treatment under the San José Scale Act. These are : (1) greenhouse plants, including roses in leaf which have been propagated under glass ; (2) herbaceous perennials, including strawberry plants ; (3) herbaceous bedding plants ; (4) all conifers ; (5) bulbs and tubers ; (6) cottonwood (*Populus monilifera*), grown in Minnesota and the Dakotas.

'The fumigating houses were kept open with a superintendent constantly in attendance through the seasons of spring and autumn shipments of stock. As all vege-

tation is much earlier in Oregon and Washington States, from which most shipments are made into British Columbia, it has been arranged that for that province the fumigating house shall be kept open for the winter months from October 15 till March 15. For Manitoba and the eastern provinces the spring season is from March 15 till May 15, and the autumn season from October 7 till December 7.'

The provisions of the federal San José Scale Act have been rigidly enforced and with excellent results, for there has not been a single well-founded complaint of injury to stock, of undue delay chargeable to the fumigation or of living scales having been found on any trees in the large number of consignments of nursery stock which have been imported into Canada through the fumigation stations. The superintendents of the various stations are as follows :—At St. John, N. B., Mr. Herbert E. Goold ; at St. John's, Que., Mr. P. H. Dupuis ; at Windsor, Ont., Mr. Colborne Wright ; at Niagara Falls, Ont., Mr. O. N. Garner ; at Winnipeg, Man., Mr. A. K. Leith ; and at Vancouver, B.C., Mr. Tom Wilson. Every one of these officials has shown the greatest interest in the work and, recognizing the responsibility imposed in him, has made every effort to do the work thoroughly and well.

There has been some misapprehension in the province of British Columbia as to the exact object the Honourable Minister of Agriculture had in view when establishing the fumigating house, and it is well to state plainly that this work is being done simply and solely against the San José Scale. The length of the exposure to which the trees are subjected to the poisonous gas is calculated for the destruction of that insect alone. Incidentally, many other insects on the bark of the trees are destroyed ; but there are several, such as borers inside the wood, or insects in the egg condition, which would be little affected by the short exposure of 45 minutes, and there never was the slightest idea when the work was instituted, that these would be reached by this fumigation. From the publication in a British Columbian newspaper of a letter containing an unjust and unfair criticism of the fumigation work being done at Vancouver, it became necessary to publish an explanation of this fact in the same newspaper, the Vancouver *News Advertiser* (December 3, 1901).

In this connection it is but just to draw attention to the excellent work which has been done in Canada by the provincial Government of Ontario, through Mr. George E. Fisher, the Inspector of San José Scale, who, since his appointment, has worked most assiduously under instructions from the Honourable John Dryden, Minister of Agriculture for Ontario, in tracing up nursery stock imported before the enactment of the San José Scale Act, in inspecting nurseries and orchards, and in trying careful experiments with spraying pumps and nozzles, several important modifications and improvements of which are due to his ingenuity. Mr. Fisher has also tried every remedy which has been advised from time to time. I have had the privilege on many occasions of examining this work and can testify to the zeal and care which have been shown at all times by Mr. Fisher and his assistants. The most useful report of the Inspector of San José Scale for 1900, published by the Ontario Government last spring in time for use in 1901, ought to be read carefully by every one interested in fruit-growing in Ontario.

There is at the present time a much more decided and intelligent interest in this subject than has been the case since the first appearance of the San José Scale in Canada. Fruit-growers have learnt by bitter experience in some cases, or they have seen in the orchards of others evidence of the capabilities of the San José Scale for destroying fruit trees and the rapidity with which this work is accomplished. As a result many are now trying remedies, who a short time ago refused to believe that there was any use in them, or that any remedy was necessary.

Remedies.—The great outcry to-day is for a definite remedy. After examining the results of the Ontario experiments, and those of Prof. Webster, in Ohio, which, on account of the very similar conditions prevailing in the two areas infested, are complementary to each other, it is evident that there are three remedies, which may be called practical remedies, by which the San José Scale may be controlled to such an

extent that the owner of an infested orchard may hold the scale measurably within control and that at the same time the trees can by thorough treatment every year be kept in a condition to bear paying crops of fruit.

Whale-oil soap and crude petroleum, applied carefully as recommended below, will kill 90 per cent of the scales, and fumigation with hydrocyanic acid gas will, at a moderate expense, kill every scale on trees small enough to be covered by tents, barrels, boxes, or other tightly closing structures, of which the cost of manufacture and handling is not so great as to make the operation impracticable. What is possible on a few trees, will in time be done on many if it can only be shown that it is a paying operation. Since experiment has shown that with the below described remedies a larger proportion of the insects can be destroyed than are produced naturally every year, it is only a logical conclusion that the trees will year by year become freer and freer from this most pernicious enemy. I feel sanguine that with constant treatment, such as is year after year practised for some other crop pests, even orchards infested by the San José Scale may before long be rendered free of that pest. But regular annual treatment is absolutely necessary while there are any living scales on a tree. Where infested trees have been neglected for only a single summer, they have quickly become coated over again with the scales so as to be almost, or quite as bad, as they were before they were treated.

The three remedies which have been proved to be the best in Ontario and northern Ohio are the same which were mentioned in my last report, but further experiments during the past summer have added to our knowledge, as to the best way to apply them :—

1. Whale-oil soap.—This is a trade name for a potash fish oil soap which can either be made at home or purchased from firms in Canada, who have made a specialty of manufacturing it, with only the required amount of moisture and with the proper amount of potash. Two of the brands made in the United States, which have given good satisfaction to those who have used them in Canada, are those of W. H. Owen, of Catawba Island, Ohio, and Good & Co., of Philadelphia, Pa. To be efficient, these soap washes must be made of the strength of 2½ pounds of the soap to the imperial gallon of water, and to dissolve the soap thoroughly it is necessary to use hot water ; the mixture to be applied in the form of a spray before it cools if possible. This, however, is not necessary, because owing to the soap being made with an excess of potash, 10 or 12 per cent, the mixture will remain liquid when it cools, even at the above strength. The best time to spray the trees is just before the buds burst in spring. Although, as a general statement, orchards treated with this soap wash in Ohio were not so free of the scale as those which had been sprayed with a crude petroleum mixture, still it is a significant fact, that the two cleanest orchards of all those examined in an area of 35 miles across, which had been at one time infested and had been subsequently in a certain measure cleaned up, had been brought to their present good condition by the use of whale-oil soap. No very bad trees could be found in those orchards, and it was only with difficulty that any scales could be seen. For peach trees this remedy is decidedly the safest to use. Its only drawback is the cost of the material. In large quantities it can be purchased or made for about 3½ cents a pound, and, of the strength above advised, it would require one and a half gallons of mixture containing 3¼ pounds of soap to an average-sized full grown peach tree, making about 12 cents for material for each tree. The great advantage is that there is no danger of injuring the trees, and, further than this, the amount of potash in the soap makes it a decidedly beneficial application for the trees. There is good evidence that whale-oil soap is an excellent remedy for the fungous disease known as the Peach Curl (*Exoascus deformans*, Tul.) which for many years has caused much loss in Ontario peach orchards. It is also useful against many other insects than the San José Scale, particularly several kinds of scale insects, the Pear Psylla and others, which pass the winter hidden beneath scales of the bark of fruit trees.

2. Crude petroleum, where it has been thoroughly applied, has had a decidedly quicker and more fatal effect upon the scale insects than the whale-oil soap, but it is

also very much more liable to injure the trees treated. Crude petroleum may with care be applied to healthy peach trees in a mechanical mixture with water containing 20 to 25 per cent of the oil ; but, when using this mixture, it is rather difficult even with the best pumps made for the purpose to keep the percentage of oil constant, and, if applied carelessly by reckless, inexperienced or inattentive men, there is great risk of the trees being killed. When recently examining the results of the experiments made with crude oil on Catawba Island, Ohio, and also in Ontario, the benefit of special training of operators in this kind of work was very apparent. Where orchards had been carefully and skilfully sprayed, excellent results had followed. This was particularly the case where the work had been done by the trained Government officials, but, besides this, where good practical fruit-growers had carried out instructions carefully, the trees had been protected and paying crops had been gathered. The advantage of experience was also conspicuous in some of these orchards, the owners acknowledging that, although they thought they had done good work the first year, they could easily see that the second year's work was far better, and they believed that they would be able to do more thorough work next year and secure better results. Where trees, as was the case in some places, had been treated in an indifferent or perfunctory manner, very little good had been done, even although considerable expense had been incurred. Spraying for the San José Scale, to be effective, must be done with the greatest care as to every detail, and with great thoroughness, so that every part of the tree is reached with the material sprayed. I found that one of the most fertile causes of imperfect work was the difficulty of reaching the whole of a tree with the mist-like spray in which it is necessary to distribute the liquids. This work is facilitated very much by a wind which will help to carry the spray through the branches. Unfortunately, a change of the wind favourable for spraying both sides of the trees seldom occurs in the same day, or within a short space of time. Several fruit-growers had sprayed one side of their trees, but as there had been no favourable wind for the other side, only half of each tree had been treated. The good effect of the crude oil was remarkably apparent on some of these trees which had been only lightly infested in the spring. The side which showed on the bark the residue of vaseline left after the volatile parts had evaporated, was free of living scales, while on the other side of the same branch there was a thick coating of healthy scales reaching right up to the oily surface. Crude petroleum is a very effective and cheap remedy, but great care must be exercised in using it.

During the summer of 1901 the experiments with this substance have been earnestly watched by fruit-growers, and several have themselves experimented with it. Much good work has been done on peach trees with a 15 per cent mixture, and no cases of injury are recorded. As an outcome of this work, there will doubtless be a much more extensive use of crude petroleum oil next year. It is to be feared that the good results obtained in destroying a large proportion of the scales without injury to the trees with 15 per cent and 20 per cent mixtures may, next season, possibly give rise to a reckless or careless spirit when spraying orchards so as to get quicker and more decided results. This is a real danger and it seems most desirable to advise caution, or there may be considerable loss from trees being sprayed with too much oil. Fruit-growers must bear in mind that the application of remedies for such a persistent enemy as the San José Scale is no easy matter which can be attended to by an untrained man, unless the greatest care is exercised. From what I have seen of the work, I judge that the heavy oils are the safest and the most effective. Prof. J. B. Smith, of New Jersey, says :—'It is a fair requirement that a straight crude petroleum should have a specific gravity of 43° or over by the Beaumé oil test, at a temperature of 60° Fahr. ; anything less might be harmful ; anything more than 45° is unnecessary.' When the heavy oils have been used, the deposit of vaseline on the bark remains for a long time and without injuring the trees renders the bark unsuitable for the scales to fix themselves. The oils which have been used for the most part in Ontario are Canadian oils which Mr. Fisher tells me test 39·10° to 39°, Beaumé. Upon peach trees

crude oil should not be used in a higher percentage than 20 per cent. The safe limit for plums and pears seems to be 25 per cent, and for apples 30 per cent may be used. For peach trees, Mr. Fisher believes that not more than one quart of crude oil, costing two or three cents, should be applied to each average-sized peach tree, whether this be applied undiluted by means of a very fine specially prepared nozzle or in a mechanical mixture. The only purpose of the water in such a mixture is to act as a vehicle for the oil by which it may be distributed over a wider area as a very thin film. The water evaporates almost immediately and leaves the oil on the trees. For this reason it is important not to go over the same part of the tree twice as has sometimes been done with ill effects by thoughtless operators.

'Freeman, Ont.—The specific gravity of the Canada crude oil used against the scale was 39½° to 39°, and that of the Pennsylvania crude oil was 44½°. The Canada oil killed the scale and protected the trees from re-infestation better than the American oil, but was also slightly more trying to the peach trees. Japan plums were not injured by 25 per cent Canada oil with water, and in one instance two applications were made, the second two days after the first. The only case of injury that has come to my notice from the use of crude oil on plum trees was when it was used undiluted, and in this case Japans and the Egg varieties alone suffered.'—GEORGE E. FISHER.

3. Fumigation.—Undoubtedly the most effective remedy for small trees or bushes is fumigation with hydrocyanic acid gas which will destroy every living scale without injury to the plant. For small trees this has proved most useful, but for large trees the necessary tents and apparatus are expensive, easily injured, and handled with difficulty, particularly when there is a wind blowing. There are also difficulties which are yet to be overcome in the way of getting the gas equally diffused beneath large tents. Mr. George E. Fisher has done good work by using inverted tight barrels as gas chambers for fumigating bushes and small trees. These were ordinary tight apple barrels each of which contained 4¼ cubic feet of space and for which 1¼ grammes of cyanide of potassium, 2 grammes of sulphuric acid, and 3 grammes of water were used to generate the necessary gas. In a few instances double quantities were used without any injury to the trees. Larger trees were covered with tents. Mr. Fisher says :—'We used cyanide 20-100 and 25-100 of a gramme to the cubic foot of space inclosed, mostly 25-100, though I think that 20-100 did just as effective work in September as did 25-100. The 20-100 was exposed 35 minutes and apparently killed all of the scale. Most of the trees treated with 25-100 were exposed 45 minutes without injury and 20-100 killed the scale at 35 minutes in September. I still think there is a lot in the time of year this work is done. Prof. Lowe, of Geneva, New York, says he used cyanide in various strengths from last December to June, 18-100, 25-100 and 30-100. The 25-100 had no effect in killing the scale during low temperatures, and 30-100 used at the same time killed it all—exposure in both cases 45 minutes. In June 18-100, exposure 30 minutes, killed all of the scale. This bears out my contention that the scale is much more susceptible to the gas treatment when it is active than when dormant. It also goes to show that a stronger gas will kill it in very cold weather, which I have doubted, but which I shall take some pains to prove this winter.'

In practice it may be found convenient not to trust solely to any one of the above remedies, but to use a combination of two or more, in accordance with the difficulties which in treating any orchard may arise from many causes, dependent upon the locality, the size of the trees, or the facilities for obtaining materials. For small trees fumigation will probably be found most convenient and for large ones spraying with Whale-oil Soap or Crude Petroleum after the trees have been pruned of all unnecessary wood.

When judging the conditions of trees which have been infested by scale, or which have been treated for its eradication, it is necessary to consider, first, what the condition of the trees is at the time, and also what state, judging from surrounding trees, they would have been in if nothing had been done to relieve them. It is not always

easy to detect at first sight when a tree is in a reduced state of vigour, and hidden injury may sometimes be going on in an apparently healthy tree. In estimating the effects of a remedial measure upon a tree which fails suddenly, a close examination should always be made to see if this may not have been due to some other cause. There are many insidious insect and fungous enemies of fruit trees, such as the various wood and bark borers and root-attacking enemies. As is well known, the brush pile, containing much more than the annual prunings, is a conspicuous object on all fruit farms. Dead trees—dead from various causes—are often found in all orchards, necessitating frequent renewals. Moreover, there is always a tendency to try experiments which are considered dangerous, upon trees which are injured or thought to be of little use. If these die while under treatment, care must be taken to attribute the loss to the right cause, and not unjustly to charge all losses to the remedy. There are certain indications of impaired vigour which may be recognized at sight by an observant investigator, while others, again, are more obscure. In Ohio orchards, Prof. Webster pointed out to me—and Prof. Forbes tells me that he has noticed the same thing in Illinois—that, when a tree is from any cause in an enfeebled condition, this may be frequently detected by the well-known evidence of the presence of the Fruit Bark-beetle (*Scolytus rugulosus*, Ratz.), which burrows into the bark and causes gum to exude at the openings of the galleries. This beetle, it is thought, does not attack perfectly healthy trees, but, nevertheless, its work is frequently conspicuous on trees which as yet have not shown any evidence, by the foliage and general appearance, that they are sickly. While discussing this matter recently in an Ohio orchard with the two gentlemen above named, we found an apparently healthy peach tree, which had green leaves and was bearing fruit, but the trunk and limbs were dotted with the gummy exudations which mark the work of the Fruit Bark-beetle. Upon digging around the roots of this tree, it was found that the greater portion of the root growth was dead. This accounted for the presence of the Fruit Bark-beetle on this apparently healthy tree.

Both the Peach Bark-beetle (*Phlœotribus liminaris*, Harr.) and the Shot-hole Borer (*Xyleborus dispar*, Fab.) have likewise been wrongly charged with being the cause of fungous diseases, because they have been found abundantly upon trees only showing slight traces, or as yet none at all, of the diseases. The former of these has been thought to be the cause of the 'yellows' in the peach, and the latter has similarly been written about under the title of the Pear-blight Beetle.

Mr. G. E. Fisher drew my attention to a characteristic growth easily recognized on peach and other trees badly affected with the San José Scale, in which the tree, as an effort to save itself, throws out strong water-shoots at the base of the larger branches. This is so frequent that he has styled it the 'trade mark of the scale.' It was very apparent in one orchard of seriously injured apple trees which we visited together, near Blenheim.

THE GRAPE-VINE COLASPIS

(*Colaspis brunnea*, Fab.).

Attack.—Small pale yellowish beetles about one-fifth of an inch long, with elevated lines on the wing covers, swarming on grape vines in July, August, and September, feeding on the foliage, riddling it with small round holes, sometimes leaving little more than the veins of the leaves.

Fig. 18.—The Grape-vine Colaspis—enlarged and natural size.

During the past summer the first recorded occurrence in Canada of this insect doing damage was reported as follows:—'Queenston, Ont., July 15.—I send you three small enemies and a grape leaf. For three years I have been troubled with them. They appear in July and are on the increase until early September, when they suddenly disappear. In 1899 I had three acres of young grapes badly eaten before I noticed them. Spraying with Bordeaux mixture checks them, though does not entirely rid the vines. As no one here knows the insect nor has had trouble with

it, I take it to be an unusual visitor. Kindly tell me what it is and the best way to eradicate it.'—W. O. BURGESS.

Mr. Burgess was written to that his enemy was the Grape-vine Colaspis, and informed that the remedy usually recommended was to jar the beetles from the vines early in the morning onto sheets spread beneath, when they could be collected and destroyed. He answered as follows :—

'Queenston, July 18.—Even in the early morning the beetles fly so quickly that it would not be feasible to shake them from the vines, as you suggest. I have 2,500 vines, more or less damaged at the tips, and, from the experience of the past two years, I expect next month to be the worst.'

'Toronto, November 27.—In reply to your inquiry, I tried about July 18 (when the beetles first made their appearance in any numbers), first, 4 oz. Paris green in 40 gallons Bordeaux mixture, then 5 oz., and then 6 oz., without doing any real damage to the foliage ; yet it was hardly a success. It was then that I wrote you in reference to whale-oil soap. After receiving yours in reply, as I had no soap handy, I decided to go a little stronger and used 7 and 8 oz. of Paris green and lime and water, but no bluestone. This spray mixture cleaned out all the beetles (practically) and did some considerable damage to the tips. Take it all in all, the 7 oz. should be sufficient to destroy the Colaspis, and the vines soon get over the effects of the burning. They were set back very little with me. One block of 1,188 vines of the spring planting were badly "hit"; yet, a vineyard of the same size at the other end of the farm, which as a "spring planting," was badly eaten, as a yearling block, was left alone. With me the Colaspis only attacks the spring planting and leaves the sturdier vines alone. I believe 4 oz. of Paris green is not sufficient, and another year I will use 7 oz. and try and get them early. If I remember correctly, the beetles appeared the same time each year, about the 15th July.'—W. O. BURGESS.

The life history of the Grape-vine Colaspis has been studied by many investigators. Dr. C. V. Riley published an article on the subject in his *Third Missouri Report,* and Prof. Forbes has also treated of it at length in his *Thirteenth Report,* p. 156.

The injury by this beetle is, as was noticed by Mr. Burgess, largely confined to the tender foliage of young grape vines. There are many plants, however, which are occasionally attacked by it in either the larval or perfect form. Among other plants, injuries have been reported upon strawberries and beans, upon which the attack is frequently of a serious nature, the roots of strawberries being injured by the larvæ, and the leaves of strawberries and beans being destroyed by the beetles. Other plants attacked are the potato, clover and the dock. The beetle has also been noticed devouring the silk of corn before the kernels had been fertilized.

Dr. Riley was of the opinion that this insect should have been considered primarily a strawberry pest. He says, *Missouri Rep. 3,* p. 83 : 'We are now treating of this insect as a grape-vine pest ; but it is difficult to say whether the Crown-borer (*Tyloderma fragariæ,* Riley) or this root eater is the most injurious to the strawberry. The work of the two is esentially different, the white Crown-borer confining itself to the crown, and its more dingy ally devouring the fibrous roots and working into the more woody part from the outside. At this work several of them frequently may be seen with their heads stuck into different parts of one root. They may be found upon the roots all through the fall, winter and spring months, and do not begin to change to pupæ in this latitude till the month of June. The beetles appear during that month and continue to issue till towards fall.' After leaving the ground the Grape-vine Colaspis beetles feed for a short period on the young leaves of the strawberry and do some injury. After feeding for a time, they deposit their eggs and fly to the vineyards, where they are found, as was the case in Mr. Burgess's vineyards, about the middle of July.

The remedies which have been recommended are the application of poisonous mixtures to the foliage and the shaking of the beetles from the vines very early in the morning before they become active. Whale-oil soap has been found very effective

against some beetles which are little affected by poisonous mixtures, such as the Rose Chafer (*Macrodactylus subspinosus,* Fab.) and the Striped Blister-beetle (*Epicauta vittata,* Fab.), and it is probable that it might also be useful against this chrysomelid. It would be well worthy of a trial, should the beetles be found again next year either upon strawberries or afterwards when they have flown to the vineyards. The whale-oil soap now largely used by fruit growers in western Ontario is a fish oil soap containing a large percentage of potash.

FOREST TREES.

The only insect enemy of forest trees which has been the subject of considerable correspondence and which has attracted public attention, is the Birch Skeletonizer (*Bucculatrix canadensisella,* Cham.). It seriously disfigured birch trees in all parts of Ontario and in some parts of the province of Quebec in late summer. The insect was treated of fully in my report for 1892, when a similar abundance of the insect occurred. In the following year very few birch trees were injured and since 1893 nothing has been seen of it until this year. It is to be hoped that we may experience next year a similar disappearance of this enemy to the birch.

A NEW ENEMY OF CONIFERS
(*Semiophora youngii,* n. sp., J. B. Smith, ms.).

A very interesting new species of noctuid moth belonging to the genus Semiophora was discovered during the past summer to be a pest of some importance to tamarack or American Larch (*Larix Americana,* Mx.) and the Black Spruce (*Picea nigra,* Poir.). The moth, which is a very beautiful species, was reared from the larva, and the first specimens were discovered by Mr. C. H. Young, of Hurdman's Bridge, near Ottawa, a most enthusiastic and painstaking entomologist, as well as a successful breeder of insects. The species has been named in honour of the discoverer, by Prof. John B. Smith, the leading specialist in this group. The first moths were taken by Mr. Young in August, 1899. On May 30 last I visited the Mer Bleue, an extensive peat bog near Ottawa, in company with Mr. Young and Mr. Arthur Gibson. On entering the swamp it was at once apparent that some insect was stripping the young tamaracks and spruces, and after a short search we discovered that this had been done by a strikingly handsome noctuid caterpillar about an inch and a half in length when full grown, of a rich velvety brown, with a ruddy or greenish tinge in different specimens, the dorsal area showing the richest colours and bounded on each side by the white clear and threadlike lateral stripes. The dorsal stripe of the same intensity as the lateral stripes. The spiracles black and lying on the upper edge of a broad white substigmatal band, the lower surface much paler than the dorsal, the whole body finely mottled with small purplish brown spots. The centre of each segment on the dorsum is darker and more velvety than the intersegmental fold. The head is reddish brown finely mottled with lighter spots.

A large number of these larvæ were collected and a fine series of the moths was reared. The moth, as stated above, is a very beautiful species and varies so much that, had not the specimens all been reared from larvæ which showed little variation, it might have been supposed that at least two species were represented. The moth measures about an inch and a quarter across the wings and varies in the ground colour of the wings from a warm gray almost to a velvety black, the usual lines and marks of the noctuidæ are distinct in most specimens and, as a rule, heavily shadowed inside with a darker shade of the ground colour. The area beyond the subterminal line is strikingly paler than the rest of the wing, except the reniform mark, which is almost

white and conspicuous. The hind wings are fuscous. A detailed scientific description of this moth will be published by Prof. Smith.*

The moths appear at the end of August, and in the early part of September. Specimens reared in confinement and those taken under natural conditions appeared about the same time. Up to the present this species has not been taken in any other locality than in the peat bog above mentioned, but, judging from the devastation and the large number of larvæ which were collected by three of us in about an hour, this species might at any time develop into an injurious forest tree pest. The caterpillars, although well protected by their mottled appearance when on the trees, have the interesting habit of leaving the branches during the day time and hiding deep down in the sphagnum moss at the base, where they in some instances penetrate to the depth of 6 or 8 inches. The moths in nature were found by Mr. Young to rest beneath the branches and were strikingly protected by the resemblance of their mottled closed wings to protuberances on the bark of the branches.

THE APIARY.

The Apiary, under the management of Mr. John Fixter, has been tolerably successful during the past season, both as to yield and as to the interest evinced by visitors. The season has been a fair one for honey, and prices have been good. An evidence of the value of bees in orchards was provided by the poor crop of apples in western Ontario. It was noted by many fruit-growers that during the time that apple trees were in blossom there were no bees flying, and, as a consequence, little fruit was fertilized.

The colonies at the Central Experimental Farm Apiary were housed for the winter in good condition and, as far as can be judged at this date, are wintering well. Several meetings of bee-keepers were attended by Mr. Fixter, where he delivered addresses on practical apiculture and took an active part in the discussions. I myself was honoured by being invited to be one of the three speakers to represent the National Bee-keepers' Association of America at the first joint meeting of the bee-keepers and the American Pomological Society. This important meeting was held at Buffalo on September 13 and 14, during the Pan-American Exposition. The title of my address on this occasion, by request of the association, was 'How flowers are fertilized, with special reference to the Honey Bee.' This was in connection with the subject which had recently been so keenly discussed, whether bees could injure ripe fruit, when the skin of this was unbroken. During the past season, Mr. Fixter, at my request, has carried out a few experiments to test this question. These, as far as they go, are of considerable interest and tend to exonerate bees from all blame in this matter.

REPORT OF MR. JOHN FIXTER.

The season of 1901 has been a pretty good one for bee-keepers. Ontario reports show little or no disease among bees. There has been plenty of swarming, and stocks have been strong and active. But for the hot weather of July an immense yield would doubtless have been recorded. The average yield, however, will not exceed 50 pounds per colony. Some excellent basswood honey is reported and a fair share of clover honey. Quebec reports mention some excellent returns, some as high as 100 pounds per colony; the average will probably be 75 pounds. The colonies are in splendid condition for wintering.

Returns from the Central Experimental Farm Apiary average 68 sections or 79½ pounds of extracted honey per colony.

* Since the above was written this description has appeared. See *Can. Ent.*, XXXIV., p. 29.

Meetings at the following places were attended and addresses delivered :—Cumberland, Chard, Rockland, Dunraven, Ont. ; Calumet Island, Que. ; Gananoque and Woodstock, Ont.; and at the American National Bee-keepers' Association at Buffalo, N.Y. Many apiaries were visited near Ottawa during the past summer, and it was noted that all bee-keepers are increasing the number of their colonies very fast and greater interest is being taken in bee culture.

Experiments with different kinds of Hives for comb and extracted honey.

Two hives of each of the following sorts were used :—the Langstroth, the Hedden and two other kinds more or less used in Canada, one measuring 15 x 15 x 12 inches, the other 15 x 20 x 15 inches. Eight colonies of bees were selected all of about the same strength and having good laying queens. The results from the four kinds of hives are shown in the following table, one hive of each kind being arranged for section honey, the other for extracting honey. The hives are tabulated in the order of the returns they gave.

Hive.	Swarms.	Sections produced.	Extracted honey.
			Lbs.
1. Langstroth	1	67	79
2. 15 x 15 x 12 inches	1	56	63
3. Hedden	0	54	62
4. 15 x 20 x 15 inches	0	0	23

The large hive 15 x 20 x 15 inches appears to be too large ; the bees building up well in the brood chamber but not going up into the surplus boxes, either in sections or extracting frames.

Further Experiments in feeding Sugar Syrup for Winter Stores.

During the autumn of 1900, an experiment was started with four colonies. All the natural stores were removed on September 17, 1900. A Miller feeder was placed in an empty section super, close to the top of the brood frames, any part of the brood frames not covered by the feeder being covered with a propolis quilt cut so as to allow the bees a passage through it. By keeping the feeder well packed around, except where the bees enter, the heat is kept in and at the same time the bees cannot daub themselves with the liquid. In this experiment the bees had a constant surplus of syrup. This syrup was made of the best granulated sugar, two parts to one of water by weight. The water was first brought to a boil, then the boiler was set back on the stove and the sugar having been poured in the mixture was stirred until the sugar was all dissolved. This syrup was supplied to the bees at about blood heat. When put into winter quarters the wooden covers were removed and replaced with a chaff cushion ; the hives were also given extra ventilation at the bottom by placing at the entrance a wooden block between the brood chamber and the bottom board, raising the front of the brood chamber about 2 inches extra. During December and January considerable, though not excessive, humming could be heard. During February and March and until they were set out, there was but very slight humming. There was no sign of uneasiness nor any dysentery during the whole winter. Each colony when put into winter quarters weighed on an average 52½ lbs. ; when taken out in the spring, 40 lbs. 10½ oz. The hives were set on their summer stands April 1, 1901. The bees then began to work at once and built up rapidly and were in excellent condition when the honey flow came on. During the summer each hive gave one swarm and made on an average 78 sections of honey. This experiment will be continued with the same colonies and their progeny for several seasons.

Experiments with Foundations of different sizes in Sections.

Experiments have been continued with comb foundations of different sizes in sections. There were in each hive four sections for each size of foundation.

(1.) Full sheets fastened at the top and fitting closely to the sides and down close to the bottom.

(2.) Half sheets fastened at the top of the section.

(3.) Quarter sheets.

(4.) Two inches square, fastened in top centre of section.

(5.) One inch square, fastened in top centre of section.

(6.) No foundation at all.

No. 1.—Full sheets of foundation gave the best results ; the bees began to work on them first and filled them out better. When the sections were shipped, they did not break so easily, and consequently they brought the highest prices.

Nos. 2 and 3.—Very few of the sections which had only one-half or one-quarter sheets of foundation were well filled ; in no instance were they filled as well as those with full sheets.

Nos. 4 and 5.—The bees did not begin to work in these sections until they had the full sheets nearly all drawn and filled. Several sections were only half finished.

No. 6.—The bees did not start to work in any section where there was no starter. From this and many other experiments the advisability of always using full sheets of foundation is apparent. This should be of soft thin wax so that it will not be noticeable when the comb-honey is eaten.

Experiments with Brood Foundations of Different Sizes.

(1.) Full sheets. (2.) Half sheets. (3.) Two-inch strips of foundation across the tops of the frames.

(1.) Full sheets in every instance appear to be the best ; the bees go to work on them at once and they build all worker comb on the foundation ; a few drone cells are sometimes built where the comb does not touch the bottom or sides of the frame ; this alone is quite an advantage. Moreover, the sheets are securely wired, making them fit for either brood or extracting frames ; they will also stand a heavy swarm, or shipping without breaking down. (2.) Half sheets.—The bees built worker comb as far as the foundation went, then the balance drone comb. (3.) Strips of Foundation.—In this instance the bees started to work, not in the frames, but in the sections in the super, which had full sheets of foundation, sooner than in No. 1 and 2. Queen excluders had to be put on to prevent the queen going up into the super. The combs in the brood chamber were very unevenly built so that the frames could not be lifted out without the combs being broken, and some of these combs were more than half drone cells. They could not be used for extracting frames, as, not being wired, they were too weak. From the results of this experiment and the previous one, it is therefore plainly better in all cases to use full sheets of foundation both in the sections of the supers and in the frames of the brood chambers.

Experiments to test whether Bees injure Sound Fruit.

For many years the question as to whether sound fruit was injured by honey bees has been under discussion, but last year special attention was drawn to this question by a law-suit between a fruit-grower and a bee-keeper, the former claiming that his fruit had been seriously injured by the bees of his neighbour, while the bee-keeper brought evidence to show that not only was this not the case, but that it was impossible. This question was of so much interest to bee-keepers that the following experiments were undertaken to determine whether bees, even when deprived of food, would attack fruit placed within their reach. The results here given indicate that such is not the case, which merely confirms the conclusions arrived at many years ago.

Prof. Slingerland, of Cornell University, in an article in the Rural New Yorker of November 10, 1900, cites the experiments which were carried out in 1885, by Mr. N. W. McLain, of Aurora, Ill., by instruction of Prof. Riley, United States Entomologist, from which these conclusions were drawn. (See U.S. Ent. Rep. 1885.)

On September 7, 1901, when there was no surplus honey to be gathered on plants outside, ripe fruit of four different kinds, viz., peaches, pears, plums and grapes, was exposed in different places near the Experimental Farm Apiary where it was easily accessible to the bees—

(*a*.) Inside bee hives ;

(*b*.) On branches of trees in the apiary inclosure ;

(*c*.) On shelves in a work-shop to which bees had access through an open window.

Every care was taken that all the fruit used in this experiment should be perfectly sound.

A.—Fruit exposed inside bee hives.

The fruit was exposed in three different conditions : (1.) Whole fruit without any treatment ; (2.) Whole fruit which had been dipped in honey ; (3.) Fruit which had been punctured in several places with the blade of a penknife.

Four colonies were selected for this experiment, all of about equal strength. Each of these colonies was in a hive upon which was placed a super divided in the middle by a partition. From two of the hives the honey had all been removed, in the two remaining hives five frames were left, each having considerable brood, with honey around it. The former two at the beginning weighed on an average 27 pounds, the latter two 34½ pounds. In each one of the four hives, the whole specimens of fruit not dipped in honey were hung within three empty frames, tied together as a rack ; the whole specimens of fruit dipped in honey were placed in one compartment of the super and the punctured specimens were placed in the other.

The bees began to work at once both upon the dipped and the punctured fruit ; the former was cleaned thoroughly of honey during the first night ; upon the punctured fruit the bees clustered thickly, sucking the juice through the punctures as long as they could obtain any liquid.

At the end of seven days all the fruit was carefully examined. The sound fruit was still uninjured in any way, but had the surface polished and shining as if the bees had been travelling over it trying to find some opening through the skin. The dipped fruit was in a like condition, quite sound, but every vestige of the honey had disappeared. The punctured fruit was badly mutilated and worthless, beneath each puncture was a cavity and in some instances decay had set in.

The experiment was continued the following week, the undipped sound fruit being left in the brood chamber ; the dipped fruit was given a new coating of honey and replaced in the super, and a fresh supply of punctured fruit was substituted for that which had been destroyed.

At the end of the second week, the condition of this fruit was entirely similar to that of the first lot.

For the third week fresh samples of fruit of all the above kinds were used, because some of the sound fruit had begun to decay ; this fruit, however, had the skin unbroken, and in no case had the bees done any damage. The results were the same as before.

After the third week the bees belonging to the two hives which had been deprived of all the honey appeared to be very sluggish, and there were many dead bees about the entrances of the hives. These colonies had lived for the first three weeks on the punctured fruit, and on the honey off the fruit which had been dipped. As there were at that season few plants in flower from which they could gather nectar, these bees had died of starvation notwithstanding the proximity of the ripe, juicy fruit. This supply of food, which they were urgently in need of, was only separated from them by the thin skin of the fruit, which, however, this evidence seems to prove they could not

puncture, as they did not do so, although they kept crawling over it continuously.

The mean weight of each of these two hives on the 7th September, when the experiment was begun, was 27 pounds. At the end of the experiment, four weeks later, each had lost 3½ pounds. The mean weight of the two hives in each of which were left five frames with brood and honey, was at the beginning of the experiment, 34½ pounds. The mean loss for each of these hives was 2¼ pounds.

B.—Fruit exposed in the open air, hung from the branches of a tree in the apiary inclosure.

In this experiment two sets of whole fruit were used, one being dipped in honey, the other punctured as before. The bees worked exactly as in the hives and with the same results.

C.—Fruit exposed on shelves in a workshop, adjoining the honey-house.

This, like the preceding experiment, consisted of dipped fruit and punctured fruit. Although the bees did not work so freely inside this building as they did on the fruit hung outside on the trees, and that in the hives, still the results were practically the same in every case.

Answers to Correspondents.

Question 1.—One of my hives is full of webs and grubs. What is the remedy ?

Answer.—The grubs are the caterpillars of the Bee Moth (*Galleria mellonella*, L.), more properly called the Wax Moth, the most troublesome of the enemies of the bee-keeper. Fig. 19 shows it in its different stages. The full grown caterpillars or 'grubs' shown at 19*a*, natural size, are very active, of a dirty white colour, when full grown about an inch in length. They sometimes occur in large numbers in neglected hives, and eat long galleries through the comb, feeding on the wax and the bee bread in the cells, destroying also any young bees that come in their way, and finally driving the colony from the hive. The eggs of the Wax Moth are very small, oval, glistening white at first, but assume a pink colour before hatching. They are inserted by the mother moth into any crack or crevice in or about the hive, by means of a long tube-like ovipositor. As soon as the young caterpillars hatch they begin to spin, as a protection, a silken tube in which they live during their whole larval life. This tube is enlarged and extended as they progress. When full grown they leave these tubes and creep into a crevice or corner, generally near the bottom of the hive, where they spin a tough cocoon (Fig. 19*b*) of white silk mixed with pellets of black excrement. The pupa (Fig. 19*c*) may be found inside the cocoon. The perfect insect is figured of natural size, a female with wings expanded, at *d*, and a male at rest at *e*. There are normally two broods of this moth in the season, the first appearing in May and the second, usually much more numerous, in August. In infested combs brought into a heated office for study, the moths appeared at the end of March and through April well into May. The moths are of various tints of dusky gray and differ a good deal, some being much lighter in colour than others, and some specimens of both sexes being of a more ruddy brown. They are not easily seen when at rest, as in colour they resemble very closely old weathered wood, a resemblance which is heightened by numerous dark spots on the wings. The peculiar shape of the wings, as is shown in the figure above, will easily enable any one to identify this insect. The moths are about three-quarters of an inch long, and when at

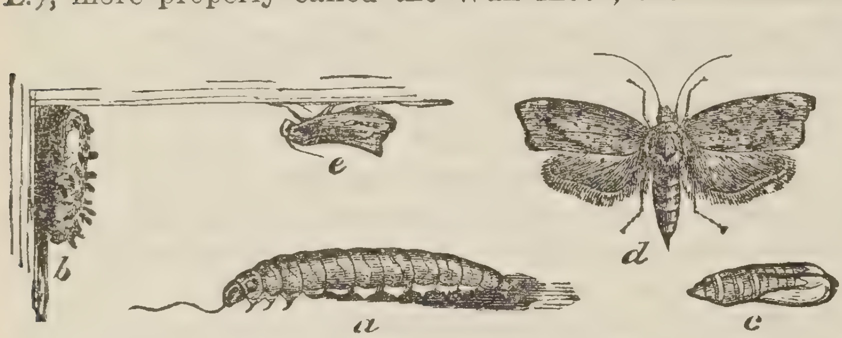


Fig. 19.—The Wax Moth ; *a*, caterpillar ; *b*, cocoon ; *d*, female moth ; *e*, male moth at rest.

rest the wings are folded so as to leave a narrow flat space at the top, and then slope downwards abruptly. When disturbed they run with great rapidity and slip quickly beneath any available shelter. They fly with ease and enter bee hives about dusk for the purpose of laying their eggs.

The indications of the presence of the Wax Moth grubs in a hive are well known to most bee-keepers. If the little black pellets of excrement, like small grains of gunpowder mixed with bee-bread or broken cappings, are at any time noticed on the bottom board around the entrance, the hive should at once be carefully examined, and steps taken to remove any caterpillars that may be found. If attended to promptly while the grubs are few in number, this is an easy matter, but if they are neglected and allowed to increase, as they will very rapidly in the spring, much destruction will be wrought in a surprisingly short time. When a grub is detected, it should be picked out with a knife or other sharp instrument (a pair of fine but stiff tweezers will be very convenient) and crushed. There will, of course, be some injury to the comb, but this the bees will soon repair. When the grubs occur only in small numbers, the bees will, as a rule, if the colony be of proper strength, keep them down themselves. Italian bees are rarely injured by moths. The wide-awake bee-keeper will also provide against weak and queenless colonies, which from their enfeebled condition are the surest victims to moth invasion. No bees either Italian or Black will be troubled so long as the combs are covered with bees. If through carelessness a colony has become thoroughly victimized by these wax devourers, the bees and any combs not attacked should be transferred to another hive, after which the old hive should be fumigated with sulphur, then by giving one or two of each of the remaining combs to strong colonies, after killing any pupæ that may be on them, they will be cleaned and used ; while by giving the weak colony brood and, if necessary, a good queen, it will soon recover.

The following experiment was carried out. Two hives which had been deserted by their swarms in the autumn, were left in the bee yard until the bees were taken into the cellar for the winter; both hives were full of empty combs and had many evidences of the presence of the Wax Moth grubs. One of these hives showed more injury than the other. The one which had the most grubs was closed up tightly and was left in the house apiary for the winter, where it was exposed to the winter frosts to destroy the grubs. It was examined at different times and was kept in the same place until the swarming season the next year, when, as all the grubs of the Wax Moth were killed, it was given to a new swarm, and was as good as if there had never been a grub in it. The other hive, which at first showed the least symptoms of injury by the Wax Moth, was kept in the bee cellar where the temperature would average about 45 degrees during the winter. This hive was also tightly closed at the top and bottom like the former, so that no moth could either get in or out. In the spring, when carried out at the time the bees were set out, it was found to contain hundreds of grubs and winged moths. The comb had been entirely destroyed and was bound together into a solid mass by the webs. From this experiment and others (See Report Entomologist and Botanist, 1895, p. 174-177), it is clear that freezing is a good method to keep down the Wax Moth in all localities where the thermometer drops to zero (Fahr.) during the winter.

All empty combs should during the winter be suspended from strands of wire stretched across a dry shed, so that they will be safe from mice, but at the same time exposed to the full intensity of the winter cold. During the summer while not in use all empty combs should be kept in a dark cellar and examined at short intervals.

Question 2.—How should bees be packed for shipping in hot weather ?

Answer.—During hot weather great care must be exercised that bees are not smothered or their combs melted, by the great heat which is generated inside the hive when insufficient ventilation is provided during transit. To ship long distances it is necessary to remove both the top and bottom boards of hives and cover both the top and bottom with fine wire cloth. The covers must be put back again as a protection,

but over, and raised from, the wire cloth, which must be carefully tacked over the two ends of the brood chamber. The boards are supported at each corner on blocks one inch by one inch, and about two inches long, with a single screw through each to hold it in its place. The wooden covers which are supported by the blocks are also made fast by screws. The entrance must be covered with wire cloth. For short distances the bottom board may be left undisturbed. It is almost absolutely necessary that combs should be wired, or at least that they be old and tough and securely attached to the bottom bar. It is always risky, however, to ship combs when not wired, for it is impossible to tell what sort of rough usage the package may receive at the hands of express agents. The bees buzzing around the wire cloth are usually sufficient to guarantee gentle handling, but, as many people do not know how to handle and take care of bees, plain instructions should be placed on each hive.

Question 3.—Is it safe to move bees from one part of the apiary to another ?

Answer.—A great many mishaps have come about from moving bees unwisely. A little thought in regard to the habits of bees will save this. Bees fly from their hives, when looking for honey, one or two miles, but seldom farther than that, unless at a time of great scarcity of pasturage. After a bee has once learnt the location of its hive, it never stops to take the points when leaving the hive, as it does the first time it sallies out in a new locality. The consequence is, if a hive has been moved either by night or by day, bees will when returning with honey fly straight to the old location, and, if on reaching that they find the hive is gone, they are helplessly lost and, even though the hive may be only a few rods away, they will not find it. Whenever hives are moved even short distances during the working season, there is always, as a consequence, a loss of some of the bees. Italian bees, as a general thing, make themselves at home in a new location more readily than the Black bees, and stick more tenaciously to their home and brood. Sometimes shaking the bees down in front of the hive and letting them run into it again, like a natural swarm, will be sufficient to make them stick to a new locality.

Another plan, which has been tried successfully, is to take the hive away for an hour or two until they get really frightened at the loss of their home. They will then all go in eagerly as soon as the hive is brought back to them again. In this case they seem so glad to get their old home again that they will stay in it wherever it is placed.

Sometimes when it has been necessary to move a colony, we have succeeded by first moving the hive to its new location, then placing an empty hive with a comb in it on the old stand for the returning bees to cluster on, because many of them, after leaving the hive in its new location, will not be able to find their way back to it again and will go back to the old stand. These must be taken back to their new location and shaken out close in front of the hive just before dark.

The best plan to follow, when it is necessary to move colonies, is to place a piece of board, or hang an old sack over the front of the hive, so that the bees, when they come out, will recognize that there is a striking change in their surroundings and will circle round and round the hive to take their bearings. These obstructions may be removed after one day, and no further trouble will be experienced.

Question 4.—I have a great many sections half full ; can I mix honey, sugar and water and let the bees finish them ? If so, what proportion of each would be best ?

Answer.—Do not think for one minute of using even the smallest proportion of sugar to finish sections. If you want to feed to have sections finished, use diluted honey, but very few bee-keepers have been able to make it pay. It is better to sell at a reduced price sections that are not finished and let the bees empty out any that are less than half full. Pile up, out of doors, supers of sections you want bees to empty, and allow entrance for only one or two bees at a time. If you allow a larger entrance, the bees will tear the comb to pieces. Sections partly filled may also be fed to weak colonies or those colonies which have not sufficient stores for winter in the following

manner : First, place a propolis quilt over the brood, turn back one corner for an opening, place a super full of one-half filled sections above, uncap all parts of the sections that are not already uncapped, and the bees will very soon empty them and take the honey into their brood chamber. The emptied sections may then be taken off and put away for future use. A good plan to dispose of partly filled sections is to cut each one into small pieces, say two or three, according to amount in them, and sell them at exhibitions, &c.

JOHN FIXTER.

DIVISION OF BOTANY

MAPLE SEED BLIGHT

(*Fusarium*, sp.).

During the past summer a serious enemy to the Ash-leaved Maple (*Negundo aceroides*, Mœnch) appeared at Indian Head and in the surrounding district. An account of this outbreak was reported to me by Mr. George Batho, of the *Nor'-West Farmer*, and, when Dr. Saunders was making his annual visit of inspection at Indian Head, specimens were collected and sent to Ottawa. Material was, at the same time, sent to Mr. Galloway, of the Department of Agriculture, Washington, who reports upon it as follows : 'The maple seeds are thoroughly infested with a fungus resembling *Fusarium*. This fungus is undoubtedly the cause of the failure of the seeds to fill. It is very difficult to combat diseases of this kind on such large trees as the maple. The spores of the fungus are very abundant at present on the seeds, and undoubtedly much might be done to prevent a recurrence of this trouble by gathering the diseased seeds and burning them. If possible, the trees should be sprayed with some good fungicide like Bordeaux mixture. It would be best to do the spraying next season, beginning early and repeating the applications at intervals of about two weeks until the danger is over. It is possible that it would not be practicable to spray, in which case very little can be done except to gather the diseased seeds and burn them.'

Dr. Saunders found the seeds on maples similarly injured in the vicinity of Regina, and as far as Pense. On reaching Medicine Hat, however, the seed on the trees was found to be perfectly healthy. The importance of the Ash-leaved Maple as a shade tree in the West can hardly be over-estimated, and millions of young trees are every year being grown from the seed. Should this disease which has the effect of destroying the kernel of the seed before it fills out, continue, it will be necessary for those wishing to grow young trees from the seed to obtain the seed from some other locality. The disease is, I believe, a temporary outbreak, and hardly likely to last for any great length of time. There is no record of seeds having been similarly affected in previous years.

When trees are affected with this disease the seeds begin to show the injury by the edges of the wing becoming bleached and spotted, and the seeds fail to fill. There was very little indication of this injury to maple seeds when I was at Indian Head in the beginning of July, but it was very noticeable by the middle of August. Mr. D. G. Mackay, who has charge of the forestry plantations at the Experimental Farm at Indian Head, estimates the loss at 90 per cent of the whole crop of seeds. This is a serious loss, as every year large quantities of this seed are collected for distribution to those who wish to plant them.

THE POPLAR RUST

[*Melampsora populina*, (Jacq.) Lév.].

In travelling through the North-west Territories last summer I found the Aspen Poplar (*Populus tremuloides*, Mx.) very badly affected by the fungous disease, known

as the Poplar Rust [*Melampsora populina*, (Jacq.) Lév.], kindly identified by Prof. L. R. Jones, of Vermont. Many apparently healthy trees were remarked in the month of July to have very small and sparse foliage at the tips of the uppermost branches. Subsequently these dropped their leaves and the foliage of many trees became yellow. Later the rust developed conspicuously on the lower parts of Aspen trees, over a wide area of territory.

Mr. Geo. Batho, of the *Nor'-West Farmer,* who is very observant of everything affecting crops of all kinds, sent me specimens of diseased foliage in August last, stating that the rust had been exceedingly destructive to foliage of both poplars and birches all through northern Alberta, the trees in many places being much disfigured and stripped of their leaves. The fungus on the birch foliage proved to be *Melampsora betulina,* (P.) Tul. Both the Aspen and the Birch referred to (*Betula occidentalis,* Hook.) are indigenous in the North-west and are highly valued for planting as ornamental trees on account of their compact growth and beautiful intense green foliage. In the arid country of the interior of British Columbia the beauty of the Aspen is very striking, and, with the sturdy handsome Bull Pine (*Pinus ponderosa,* Dougl.), forms one of the characteristic features of this part of the Dominion. The disease was not observed west of the main chain of the Rockies, but was very apparent in northern Alberta, and was exceedingly destructive to the foliage of the Cottonwood (*Populus monilifera,* Ait.) at Brandon, Man. One row of young trees of this poplar had been so severely attacked for two years running that most of the trees were dead or in a moribund condition when Dr. Saunders visited the Experimental Farm at Brandon in August. Specimens were sent off by him to my address in Ottawa, but knowing that I was then absent in British Columbia, he sent specimens also to Mr. Galloway, the Chief of the Bureau of Plant Industry at Washington, which were reported upon by Mr. A. F. Woods, the Pathologist and Physiologist :—

'I have borne in mind your request for information relative to rust of *Populus monilifera,* and take pleasure in supplying the following data, furnished by our Mycologist, Mrs. F. W. Patterson :

'The disease is caused by the fungus *Melampsora populina* (Jacq.) Lév., and occurs on various species of Populus in this country and in Europe. The uredospores and teleutospores are found on the same leaves, the former causing the yellowing and early fall of the leaves and the latter hibernating on the fallen leaves. The æcidial stage has not been determined with absolute certainty, but Rostrup demonstrated by experiments that the teleutospores of *Melampsora tremulæ,* Tul., which is now thought to be synonymous with *M. populina* on *Populus tremula,* germinate on the leaves and shoots of young pines, giving origin to *Cæoma pinitorquum.* The æcidiospores from the pine in turn produce the uredosporic and teleutosporic stages on the poplar leaves. Hartig also proved that the same Melampsora causes *Cæoma laricis* on the needles of the larch. These experiments, however, were made entirely upon foreign trees, and, so far as our knowledge goes, cultures of spores of *M. populina* and infection experiments with them in this country have been entire failures.

'The Hatch Agricultural Experiment Station, Amherst, Massachusetts, has been conducting experiments with fungicides on *Populus nigra* for several years, with a view of preventing or controlling the disease. In the section in which the Hatch Station is located, the fungus appears during the hot, moist weather of July and August, and, when abundant and appearing at the earlier date mentioned, it kills many of the branches, and the leaves become yellow and fall to the ground.

'The uredo, or summer spores, are formed while the leaves are still on the tree, and are soon scattered by the wind, causing the infection to spread with great rapidity. Spores develop on the fallen leaves, and these spores, which are capable of living over winter, upon coming into contact with new leaves in the spring or summer set up new infection.

'It is said that by the use of Bordeaux mixture the trees have been kept in a perfectly healthy condition. In the experiment four applications of the fungicide were made, two in July and two in August. You could doubtless secure copies of the several bulletins relating to the disease by applying to the Director of the Hatch Station. Account of the poplar rust as it occurs in Europe, is given in Hartig's Diseases of Trees, Tubeuf and Smith's Diseases of Plants, and Geo. Massee's Text Book of Plant Diseases.

'We have in our herbarium specimens of affected *Populus monilifera* collected in Dakota, Illinois, Indiana, Iowa, Kansas, Massachusetts, Montana and Nebraska.'

In view of the large number of cottonwoods which have been imported into Manitoba and the North-west Territories for planting groves, it is important that all information possible should be given concerning this disease, which may at any time develop under favourable climatic conditions and do much harm. Most of the young trees used by planters in the West are imported from Minnesota and Dakota as seedlings, which are collected in large numbers from river banks when one year old. Dr. Saunders noticed particularly that none of the varieties of poplars which had been imported from Russia had so far developed the Poplar Rust. If they should continue to show this immunity, their importance will be very much increased for the West, where already they are highly valued for their rapid and luxuriant growth.

Mr. S. A. Bedford, reporting at the end of the season on this matter, says :—'The rust was very bad indeed on our cottonwoods on the side hill just east of the house. The trees were four or five years old, made excellent growth and were very thrifty in former years, but this year they were one mass of rust. The cottonwoods by the creek side in the valley were apparently free from rust. I noticed a small amount on the native Aspen Poplar, but nothing very serious. So far the Russian Poplar has done exceedingly well with us here and is a better tree in every respect than the cottonwood, except perhaps when the latter is on wet land or on the side of a creek.'

Mr. D. G. Mackay writes that the cottonwood and Russian Poplars were quite free of rust at Indian Head, and were this year of particular beauty.

FODDER PLANTS.

Awnless Brome Grass.

Ever since the institution of the Experimental Farms a constant effort has been made to foster the cultivation of the Awnless Brome Grass (*Bromus inermis,* L.) in the more or less arid districts of the West. The success which has attended this effort is most gratifying. Thousands of acres of valuable hay and pasture are now being cultivated where but for this grass there would be nothing but exhausted prairie. Knowing that an actual instance is of far more value than much argument, I have requested Mr. C. W. Peterson, the Deputy Commissioner of Agriculture for the North-west Territories, to give me an account of an experiment he tried with this grass. He is so well known and his farm being accessible to so many, his letter will do much, I feel sure, to prove the great value of this grass for the West for hay and pasture, and as a seed crop.

'Regina, November 15, 1901.—I am in receipt of your letter of the 16th ultimo, in which you ask for certain information respecting the crop of brome grass on my farm at Calgary. As you are aware, on irrigated farms in the Calgary district, the cultivated hay crops are entirely limited to timothy, for the simple reason, that you cannot dispose of brome hay in the Kootenay district. This fact, I attribute entirely to ignor-

ance on the subject and feel certain that if a few car-loads of brome hay were pressed and sent in there on trial, a market would soon be created for it. I have a knoll on my irrigated land which cannot be reached by gravity and I, therefore, decided to seed it down with grass suitable for arid districts and picked on brome. This patch covers about eight acres, or a little less. The land was seeded down in 1897, I have forgotten just now the exact quantity of seed I used per acre. It was, however, below ten pounds. I got a good sample of hay the first year and cut about a ton per acre in 1898. In 1899, I cut about a ton and three-quarters per acre, and in 1900, I cut for seed. The latter cutting yielded me 3,300 lbs. of seed, which I sold at 11 cents per pound, receiving $368.50, and as I had an abundance of feed, I sold this brome straw, 15 tons, for $3 per ton. The eight acres gave me a return of $413.50 all told.'—C. W. Peterson.

REPORT OF THE AGRICULTURIST.

(J. H. GRISDALE, B. AGR.)

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith reports on Dairy Cattle, Beef Production, Pork Production, Sheep, and Farm Crops.

As in previous years, much of my time has been taken up attending various agricultural and live stock meetings in different parts of Canada, and, further, during the past summer I was absent 16 weeks securing a number of pure-bred cattle, sheep, and swine for the various farms under your supervision.

I am deply indebted to Mr. John Fixter, farm foreman, to Mr. C. T. Brettell, herdsman, and to Mr. J. Meilleur, dairyman, for interested and careful assistance in the various departments immediately under their charge and for help in the preparation of the submitted report.

To Mr. J. F. Watson, secretary to this division, my thanks are due for the interest and care he has displayed in the clerical work, and for the most efficient manner in which he has handled the new work of the dairy herd tests.

From December 1, 1900, to November 30, 1901, 1,470 letters were received by the Agriculturist division, and during the same period 1,533 letters were despatched.

I have the honour to be, sir,
Your obedient servant,
J. H. GRISDALE,
Agriculturist.

CATTLE.

There are on the farm at present representatives of three breeds of cattle, viz., Shorthorn, Ayrshire, and Guernsey. There are besides several grade animals of each breed ; that is, heifers or cows from a common or grade cow by a pure-bred bull of one of the above named breeds.

PURE-BRED BREEDING CATTLE.

The pure-bred cattle are as follows :—

Shorthorns.

1 bull calf, Lord Dinsdale (imp.) 6 months old.
3 cows (imp.), 3, 5 and 8 years old.
2 cows, 10 and 12 years old.
2 heifers (imp.), 1 year old.
1 calf (imp.), 4 months old.

Ayrshires.

1 bull, Twin Beauty (imp.), 2½ years old.
4 cows (imp.), 3 to 6 years old.
3 heifers (imp.), 2½ years old.
1 heifer, 1½ years old.

Guernseys.

1 bull, Wedgewood, 7 years old.
1 bull calf (imp. in dam), 5 months old.
4 cows (3 imp.), 3 to 6 years old.
1 cow, Canadian bred, 3 years old.
1 heifer, 18 months old.
1 heifer calf, 5 months old.

Most of these cattle were imported, as indicated above. Some, however, were bred by the Experimental Farms, and two cows were bred in Ontario.

The two Ontario bred cows took part in the dairy test just concluded at the Pan-American Exposition, Buffalo. One is Miss Molly, red, calved April 10th, 1889. She was bred by J. W. Rosser, Denfield, Ont., and sold to R. S. and T. E. Robson, Ilderton, Ont., from whom she was secured to take part in the above mentioned dairy test. Her dairy record was a good one, standing, as she did, first among the Shorthorns, and fifteenth among cows of all breeds. She produced in 6 months 6,894·1 pounds of milk, with an average of 3·71 per cent fat. From this milk it was estimated that 301·47 pounds of butter could have been produced. This, valued at 25 cents per pound, was worth $75.37. She cost to feed during the six months : for hay, $7.23 ; for silage, $4.96 ; for grain, $20.17, amounting to $32.36, making a net profit of $43.01 on butter alone. Besides producing such a large amount of milk, she gained in weight to the amount of 134 pounds.

The other cow, Queen Bess, red and a little white, calved October 10, 1891, was bred by James Gardiner, Farquhar, Ont. She passed into the possession of Wm. Montutle, Thames Road, Ont., from whom she was secured to become one of the herd of five dairy Shorthorns as mentioned above. Here she made a good showing, standing second in the Shorthorn herd and 34th among cows of all breeds. She produced in 6 months 6,547·9 pounds of milk, testing 3·57 per cent fat. This milk, it was estimated, contained 275·21 pounds of butter, which, valued at 25 cents per pound, was worth $68.80. She cost to feed during the 6 months, for hay, $7.21 ; for silage, $5.30 ; for grain or meal, $19.98, amounting to $32.49 in all. This left a net profit of $36.31 on butter alone. During the 6 months she gained 192 pounds in weight.

LIVE STOCK IMPORTATIONS.

June, July, and part of August was spent by the writer among the herds and flocks of Great Britain and the Channel Islands, the purpose being to study the methods of British cattle-breeders, as well as to secure a few head of pure-bred cattle, sheep, and swine for the Dominion Experimental Farms. It was decided that the cattle importation should consist of heavy milking Shorthorns, Guernseys, and Ayrshires.

Shorthorns.

The famous herds at Collynie and Tillycairn belonging to William Duthie, of Tarves, N.B., as well as Uppermill herd, the property of W. S. Marr, were visited in the north, while those of His Majesty the King, at Windsor, of J. Deane Willis at Bapton Manor, of J. T. Hobbs, at Maisey Hampton, of Sir Nigel Kingscote, at Kingscote, and many others were seen in the south.

The animals finally purchased are :—*Lord Dinsdale,* bull, dropped June, 1901, was so unfortunate as to lose his dam a few weeks after his birth and has had since to depend on the pail for his upbringing. In spite of his troubles he has done well and offers to make a fine animal. He is a light roan with an abundance of thick mossy hair, lots of style, strong lines and, for one of his age, grand masculine character. He is from the long established Berkeley Castle herd, the property of Lord Fitzhardinge, at Berkeley, Gloucestershire. This herd is under the able management of

1. Leicester Ewe. 2. Leicester Ram Stanisson. 3. Leicester Lambs.
4. Shropshire Ram (Imp. Minton bred). 5. Shropshire Ewe (Imp. Mansell bred).
6. Shropshire Lambs (Imp. Mansell bred).

James Peter, the famous judge of Shorthorns. Bates blood runs in every strain there, and no expense has been spared to secure the best, both as to character and pedigree. Lord Dinsdale's dam, a light red of unusual scale, was a very heavy milker from a very heavy milker ; his sire has also good breeding for milk production.

Lunesdale Marchioness.—A magnificent roan, dropped in November, 1896, and the dam of two beautiful heifers, is in calf to Land's End. She has a good record as a milk producer, and it is hoped to found a deep-milking family with her off-spring.

This cow, as well as Illuminata mentioned below, were bred by Edmund Potter, Esq., Lowfields, Kirkby Lonsdale, Westmoreland. Mr. Potter's herds have been bred for years as general purpose cattle and any cows not good milk producers are weeded out after the first calf. His cattle are a wonderfully uniform lot, sweet, smooth and well fleshed.

Illuminata.—A deep fleshed red, dropped in 1899, is from the heavy-milking cow Lustre, and is in calf to Land's End.

From the herds of Mr. Scott Murray, Hambleden, Henley-on-Thames, was secured the deep-milking cow *Darlington Lass.* She has a well-established milk record, and puts all her feed into the pail. She is in calf to *Hopeful Lad,* and something good is hoped for.

Jessica Elmhurst.—Dropped in July, 1901, is from the same herd and from the best cow of the herd. She is a dark red and is faultless in Shorthorn character and conformation.

Janet.—A light roan cow calf, dropped in October, 1900, is a sweet, smooth, deep-ribbed, well-fleshed, broad-fronted and strong-backed animal from Jubilee, by Union Jack. The dam is 13 years old and a cow of superior milking properties, and better Shorthorn characteristics is hard to imagine. Ten months after dropping the calf Janet she was still yielding 35 pounds ($3\frac{1}{2}$ gallons) of milk daily. She is the great dairy Shorthorn of the famous Duffryn Dairy Shorthorn herd. This herd, the property of Richard Stratton, Esq., The Duffryn, Newport, Mon., has been famous in the show ring and dairy tests for over forty years, and still holds its own, as witness the first prize yearling heifer at the Royal Agricultural Society show at Cardiff this year, bred and owned by Mr. Stratton.

From Jas. A. Peter, Esq., Berkeley, Glos., the roan cow calf, *Duchess of Vittoria 39th,* was secured. Though not so deep-fleshed nor having quite such good lines as Janet, she is probably of a sweeter Shorthorn type and is worthy of her Duchess descent, tracing back, as she does, to the famous Bates Duchesses and Waterloos. She is by North Star from Duchess of Vittoria 34th, a strong, heavy-milking red cow.

Guernseys.

A large number of Guernsey herds were visited in England, and finally a selection of a bull and three cows was made from probably the premier Guernsey herd of England, that of Lady Tichborne, Tichborne Park, Alresford, Hants, managed by David Michie, Esq.

The bull, Golden Rule, an orange fawn, dropped in 1899, has every indication of being a good sire. He has been sent to the experimental farm at Nappan, N.S., as well as Itchen Lady, a rather plain little cow of fairly good milking points.

Clatford Spot, a strong, deep coloured animal, is to represent the breed at the experimental farm at Indian Head, N.W.T., while Lily of Alderney, a finer-boned, lighter-coloured and rather more milk producing type of animal, will remain at the Central experimental farm.

Two cows were secured on the Island of Guernsey, where several days were spent among the herds. The cows selected were Honoria VIII a light fawn, white spots, dropped 1898, and in calf to Francis Masher II. She was bred by Alfred Lepatourel, Esq., La Ramee, Guernsey. In mid-Atlantic she dropped a bull calf, which offers to make a fine animal. Coming as he does from a cow of such beautiful Guernsey quality and deep-milking properties as Honoria VIII., by a sire so famous as Francis Masher II. much is hoped for.

Deanie IX., bred by T. R. Gallienne, was dropped 1898. She made a good milk record with her first calf and is from a most excellent dairy cow. She is a light fawn with white, and is a good dairy type. She is rather plain at the til, however, and was bought for performance rather than appearance.

Ayrshires.

Before any individuals of this breed were secured several of the best herds in Scotland were visited, and notes made of their chief characteristics.

It was finally decided to buy from Mr. Andrew Clement, of Glasgow, the bull Twin Beauty. This bull, brown with white spots, was dropped in 1899. He was bred by Robert Wallace, Esq., Auchenbrain, Mauchline. His dam, Old Beauty's Last, has a record of over 70 lbs. of milk in one day on grass alone. He is by Daniel of Auchenbrain, whose dam has a record quite equal to Old Beauty's Last. These two wonderful cows were still at Auchenbrain in August, and cows more nearly ideal in type can scarce be imagined.

Mr. Andrew Clement, from whom the bull was secured, is an enthusiastic Ayrshire breeder, and at great inconvenience to himself rendered invaluable services in the search for the right class of animal.

From Mr. Wallace, Auchenbrain, were secured 4 excellent two year old heifers by the famous bull Daniel of Auchenbrain, now in Australia.

From Mr. Robert Woodburn, Holehouse, Galston, were secured three cows : Nora's Last, a stylish, deep milking, good teated animal, 6 years old, Rosy, a good milking cow of a rather less striking appearance, and Soncy, a trim, neat, sweet and tidy little animal with good dairy points. Soncy goes to Nappan, with one of the Wallace heifers.

Culcaigrie.—From the hills of Galloway were brought two cows, among the best in all that land, Jessie A., of Culcaigrie and Maggie of Culcaigrie.

Jessie A. was the winner of the famous Queen's Hill cup, now the property of her breeder, he having won it three times. Maggie also took part in the winning of this beautiful trophy for her one-time owner, William Stroyan, Esq., Culcaigrie, Twynholm, Kirkcudbright.

Jessie A. is a cow of grand proportions, beautiful lines, great strength and splendid Ayrshire character. She stands a queen among dairy cattle anywhere. Maggie is smaller and something weaker, but withal has good lines, is clean cut, and is going to be a worker, as well as a thing of beauty.

DAIRY CATTLE.

The herd of dairy cattle during 1901 consisted of 29 females all told. They are:—

MILKING STOCK.

Ayrshires	1
Guernseys	1
Ayrshire grades	9
Canadian grades	2
Shorthorn grades	4
Guernsey grades	2

YOUNG STOCK.

Shorthorn grades—	
Two year olds	2
Calves	1
Ayrshire grades—	
Two year olds	2
Calves	1

Guernsey grades—	
Two year olds	1
Calves	3

On the arrival of the imported stock, several grade dairy cows were sold to make room for the new animals. Such aged cows and young cattle were retained as were fairly good representatives of grades of the breeds, Shorthorn, Ayrshire and Guernsey.

FEED OF THE DAIRY CATTLE.

The roughage ration fed during the year of 1901 was practically the same as that fed in 1900, namely, 35 lbs. ensilage, 20 lbs. mangels, 5 lbs. clover hay, and a little chaff. This ration was varied to suit the size or capacity of the cow. The meal ration consisted of different mixtures at different times. Bran, oat chop, barley meal, and pea meal made up a considerable portion of the grain ration, but gluten entered very extensively into the concentrate ration during the winter months.

GLUTEN MEAL.

This feed is proving of great value as a milk producer. It appears to be suited for winter dairying, as it forms a good supplementary ration for mangels or corn ensilage. It is open at present to the objection that it is not constant in composition. It is apparently difficult to get two samples even from the same factory alike in protein or fat content, while feeds under the same name from different factories are quite different in appearance and vary in protein and fat content by as much as 20 per cent. This uncertainty of composition is very objectionable and must be guarded against most carefully.

MILK YIELD.

The average milk yield of the herd has increased from 6,455 lbs. in 1900 to 6,760 lbs. in 1901. The butter yield per cow for 1900 was 289·6 lbs., while in 1901 each cow made 319 lbs., an increase of 29·4 lbs.

SUMMER FEEDING.

The dairy cattle during the first part of the summer were, as usual, pastured on the fifth year of the rotation ; that is, on land from which one year's hay had been cut. In August and September they were allowed to have part of the clover meadow aftermath of the fourth year of the rotation. In addition to this they were given some clover ensilage, (see page 302). Only a small amount of meal (3 lbs. ground oats per cow) was fed to such as were giving a large flow of milk and to heifers in the first period of lactation.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during 1901, save in the case of ensilage and roots, which are charged at the usual values affixed in experimental work :—

Pasture	$ 2.00	per cow per month.
Bran	15.00	per ton.
Oats, gluten meal, barley and pease	19.00	"
Clover hay	6.00	"
Chaff	4.00	"
Roots and ensilage	2.00	"

In estimating the value of the product, 19 cents per pound is allowed for the butter and 15 cents per hundred pounds for the skim milk and butter-milk. The butter is manufactured in the farm dairy and sells on the market at from 22 to 30 cents per pound, an average of 25 cents during the year. This leaves 6 cents per pound for cost of manufacture.

The following tables give in detail the particulars concerning each cow and the herd statement for the month :—

REPORT OF DAIRY HERD.

Number.	Name of Cow.	Breed.	Age.	Date of dropping last calf.	Number of Days in Milk in 1901.	Daily Average of Milk.	Total Milk for Year.	Per cent of Butter Fat.	Pounds Butter.	Value of Butter at 19 cents per lb.	Value of Skim Milk at 15 cts. per 100 lbs.	Total Value of Products.	Cost of Feed.	Profits.	Remarks
						Lbs.	Lbs.			$ cts.	$ cts.	$ cts.	$ cts.		
1	Julia	Ayrshire Grade	......	Dec. 26, 1900.	320	36·6	11,707	3·60	496	94 24	16 50	110 74	42 82	67·92	
2	Dora	"	......	Jan. 17, 1901.	300	33·0	9,893	3·40	396	75 24	13 80	89 04	42 80	46·24	
3	Bell	"	......	Feb. 14, 1901.	283	33·7	9,536	3·90	438	83 22	13 50	96 72	40 57	56·15	
4	Bloom	"	......	Nov. 11, 1900.	342	27·0	9,252	3·80	414	78 66	13 05	91 71	43 99	47·72	
5	Della	Shorthorn Grade	......	Jan. 20, 1901.	280	27·7	7,769	4·00	366	69 54	10 65	80 19	40 85	39·34	
6	Laura	Ayrshire "	......	Nov. 2, 1900.	300	25·5	7,668	3·50	316	60 04	10 50	70 54	32 70	37·84	
7	Begonia	Canadian "	......	April 7, 1901.	290	26·2	7,598	3·60	322	61 18	10 50	71 68	33 45	38·23	
8	Countess	Ayrshire "	......	Jan. 6, 1901.	310	24·2	7,527	4·00	354	67 26	10 25	77 51	40 00	37·51	
9	Florence	Shorthorn "	......	April 2, 1901.	320	21·7	6,940	4·10	335	63 65	9 60	73 25	35 25	38·00	
10	Polly	Ayrshire "	......	Dec. 7, 1900.	295	22·8	6,750	4·30	341	64 79	9 20	73 99	36 42	37·57	
11	Dairymaid	Shorthorn "	......	Mar. 15, 1901.	270	24·6	6,640	3·90	305	57 95	9 00	66 95	33 42	33·53	
12	Darling	Ayrshire.	......	Oct. 8, 1900.	300	21·1	6,330	4·50	335	63 65	8 60	72 25	26 42	45·83	
13	Bellflower	Guernsey Grade	......	Jan. 17, 1901.	305	20·3	6,216	4·50	329	62 51	8 50	71 01	36 85	34·16	
14	Forest Girl	Shorthorn "	......	" 1, 1901.	280	22·0	6,170	3·60	261	49 59	8 50	58 09	38 45	19·64	
15	Queenie	Guernsey "	......	Dec. 28, 1900.	320	16·7	5,363	5·70	360	68 40	7 35	75 75	30 30	45·45	
16	Winnie	Ayrshire "	......	Jan. 4, 1901.	225	22·1	4,974	4·20	246	46 74	6 75	53 49	35 30	18·19	
17	Ruby	Guernsey	......	Aug. 10, 1901.	270	13·8	3,740	5·40	238	45 22	4 80	50 02	33 43	16·59	
18	Hazel	Canadian Grade	......	July 16, 1900.	170	18·3	3,116	4·10	150	28 50	4 05	32 55	38 06	—5·51	Loss.
19	Dewdrop	Ayrshire "	......	" 10, 1901.	100	12·5	1,258	4·10	60	11 40	1 80	13 20	8 45	4·75	
					5,280	24·3	128,447	4·01	6,062	1,151 78	176 90	1,328 68	669 53	659·15	Aggregates.
					278	24·3	6,760	4·01	319	60 62	9·31	69 93	35 24	34·69	Averages.

MONTHLY STATEMENTS.

—	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	Total.
No. of cows giving milk.	17	19	17	17	17	17	16	16	16	16	14	16	
Lbs. of milk in month	7,657	9,989	11,073	13,552	13,530	14,191	13,991	13,440	12,076	9,525	7,277	6,262	132,563
Average for 1 day	247	322	395	437	451	458	466	433	389	308	234	209	
Daily average per cow.....	14½	17	23	26	26½	27	29	27	24	19¾	17	13	
Per cent fat...	4·40	4·32	4·22	4·16	4·28	4·37	4·16	4·15	4·08	4·55	4·45	4·47	
Lbs. butter fat	336·90	431·52	467·28	563·76	579·08	620·14	582·02	557·76	492·70	433·38	323·82	279·91	5668·32
Lbs. butter...	396·35	507·66	549·73	663·25	681·27	729·57	684·73	656·19	579·65	509·86	380·96	329·31	6668·61
Lbs. of milk for 1 lb. butter..	19·3	19·6	20·1	20·5	20·2	19·4	20·4	20·5	20·8	18·7	19·1	19·0	

EXPERIMENTS WITH DAIRY CATTLE.

As stated elsewhere, a number of Shorthorns, Ayrshires and Guernseys were imported in 1901. The females, with the addition of a few grades of each breed already in the stables, will make up the dairy herds for 1902, and some succeeding years.

There will be three distinct herds with a subdivision in each as follows : Shorthorn herd, and Shorthorn grades ; Ayrshire herd, and Ayrshire grades ; Guernsey herd, and Guernsey grades. Account will be taken of the produce in calves and milk in both pure-bred and grade herds. A strict account will be kept of the food consumed by each individual animal.

Experiments during the past year have been carried on along two lines ; to determine the effect of milking at unequal intervals and to gain some information as to the comparative value of some different rations fed in different ways. Reports on these follow :—

HOURS OF MILKING.

The experiment to ascertain the influence of hours of milking upon the amount of milk produced, and upon the quality of the same has been continued, and three separate experiments are summarized in the tables which follow.

The cows are usually milked here at 6 o'clock a.m. and 4.30 p.m. When milked at equal intervals during the experiment the hours were 6 a.m. and 6 p.m. By 'Period of change' in the following tables is meant the week succeeding the change of milking hour from 4.30 p.m. to 6 p.m. in order to make the intervals between milkings of equal lengths or *vice versa.*

Average.	DARLING.—AUTUMN TEST.					Remarks.
	Average for previous 10 days.	First period of change.	Milking equal intervals.	Second period of change.	Milking unequal intervals.	
Per cent of fat, morning	3·5	3·80	3·78	3·87	3·56	
" " evening	3·9	3·61	3·75	4·35	4·21	
" " whole day.	3·7	3·71	3·76	4·18	3·86	
Daily average yield butter fat...	1·061 lbs.	1·037 lbs.	0·988 lbs.	1·102 lbs.	0·993 lbs.	
HAZEL.—AUTUMN TEST.						
Per cent of fat, morning	3·9	4·70	4·46	4·41	4·17	
" " evening	4·1	4·27	4·41	4·51	4·55	
" " whole day	4·0	4·49	4·43	4·46	4·36	
Daily average yield butter fat...	0·960 lbs.	1·055 lbs.	0·923 lbs.	0·903 lbs.	0·889 lbs.	
RUBY.—AUTUMN TEST.						
Per cent of fat, morning	4·5	5·75	6·27	5·68	5·45	
" " evening	4·9	5·65	6·20	6·35	6·26	
" " whole day.......	4·7	5·70	6·24	6·01	5·85	
Daily average yield butter fat...	0·654 lbs.	0·627 lbs.	0·664 lbs.	0·578 lbs.	0·608 lbs.	
THERESA.—AUTUMN TEST.						
Per cent of fat, morning	3·5	3·70	4·83	4·57	4·46	
" " evening	3·9	4·36	4·70	4·82	4·71	
" " whole day.	3·7	4·03	4·76	4·69	4·58	
Daily average yield butter fat...	0·662 lbs.	0·585 lbs.	0·576 lbs.	0·672 lbs.	0·616 lbs.	
DARLING.—WINTER TEST.						
Per cent of fat, morning	4·0	4·2	4·0	3·7	3·8	
" " evening	4·0	4·5	4·1	4·1	4·1	
" " whole day.	4·0	4·35	4·05	3·9	3·95	
Daily average yield butter fat...	1·000 lbs.	1·073 lbs.	1·051 lbs.	1·02 lbs.	1·002 lbs.	
DORA.—WINTER TEST.						
Per cent of fat, morning	3·3	3·6	3·3	3·2	3·2	
" " evening	3·4	3·8	3·3	3·5	3·4	
" " whole day.. ...	3·35	3·7	3·3	3·35	3·3	
Daily average yield butter fat...	1·474 lbs.	1·695 lbs.	1·133 lbs.	1·524 lbs.	1·076 lbs.	
DEWDROP.—WINTER TEST.						
Per cent of fat, morning	4·3	5·0	4·7	4·2	4·3	
" " evening	4·6	5·3	4·5	4·4	4·6	
" " whole day.	4·45	5·15	4·6	4·3	4·45	
Daily average yield butter fat...	·489 lbs.	·511 lbs.	·468 lbs.	·464 lbs.	·401 lbs.	
COUNTESS..—WINTER TEST.						
Per cent of fat, morning	3·5	3·6	3·7	3·6	3·6	
" evening	3·7	3·8	3·5	4·0	4·0	
" whole day	3·6	3·7	3·6	3·8	3·8	
Daily average yield butter fat...	1·008 lbs.	1·011 lbs.	1·014 lbs.	1·166 lbs.	1·002 lbs.	

Average.	Average for previous 10 days.	First period of change.	Milking equal intervals.	Second period of change.	Milking unequal intervals.	Remarks.
	LAURA—Winter Test.					
Per cent of fat, morning...... ..	3·6	3·8	3·5	3·4	3·4	
" evening.........	3·6	3·8	3·5	3·5	3·7	
" whole day.....	3·6	3·8	3·5	3·45	3·55	
Daily average yield butter fat...	1·044 lbs.	1·072 lbs.	·983 lbs.	1·010 lbs.	1·010 lbs.	
DAHLA.—Winter Test.						
Per cent of fat, morning........	3·8	4·0	3·8	3·9	3·8	
" evening.........	3·9	4·1	3·9	4·0	4·0	
" whole day......	3·85	4·05	3·85	3·95	3·9	
Daily average yield butter fat...	·988 lbs.	·940 lbs.	·888 lbs.	·982 lbs.	·919 lbs.	
DAIRYMAID.—Summer Test.						
Per cent of fat, morning........	4·2	4·5	4·5	4·5	4·9	
" evening.........	4·4	4·5	4·6	5·1	5·3	
" whole day.. ..	4·3	4·5	4·55	4·8	5·1	
Daily average yield butter fat...	·860 lbs.	1·176 lbs.	1·022 lbs.	·849 lbs.	·895 lbs.	
BLOOM.—Summer Test.						
Per cent of fat, morning........	3·8	3·5	3·7	3·6	3·8	
" evening.........	4·2	3·7	3·7	4·2	4·1	
" whole day	4·0	3·6	3·7	3·8	3·95	
Daily average yield butter fat...	·640 lbs.	1·041 lbs.	·925 lbs.	·907 lbs.	·655 lbs.	
BELLFLOWER.—Summer Test.						
Per cent of fat, morning	4·2	4·3	4·4	4·3	4·6	
" evening.........	4·4	4·2	4·2	4·9	5·1	
" whole day.....	4·3	4·25	4·3	4·6	4·85	
Daily average yield butter fat...	·989 lbs.	·902 lbs.	·819 lbs.	·815 lbs.	·815 lbs.	
BEGONIA.—Summer Test.						
Per cent of fat, morning........	3·2	3·6	3·6	3·4	3·5	
" " evening.........	3·6	3·8	3·6	3·5	4·1	
" " whole day........	3·4	3·7	3·6	3·45	3·8	
Daily average yield butter fat...	1·292 lbs.	1·262 lbs.	1·059 lbs.	·907 lbs.	1·134 lbs.	
FLORENCE.—Summer Test.						
Per cent of fat, morning........	3·4	3·7	3·9	3·7	3·9	
" " evening.........	3·6	3·9	3·9	4·1	4·4	
" " whole day......	3·5	3·8	3·9	3·9	4·15	
Daily average yield butter fat...	·875 lbs.	·877 lbs.	·863 lbs.	·833 lbs.	·801 lbs.	
BELL.—Summer Test.						
Per cent of fat, morning........	3·8	4·0	3·9	3·6	3·9	
" " evening.........	4·2	3·9	3·9	4·3	4·3	
" " whole day......	4·0	3·95	3·9	3·95	4·1	
Daily average yield butter fat...	1·160 lbs.	1·283 lbs.	1·190 lbs.	1·108 lbs.	1·018 lbs.	

A study of the above records would tend merely to emphasize the conclusions reached in last year's experiment, namely :—

1. That the percentage of butter fat in milk, from morning or evening milking, is influenced by the comparative length of interval between the milking hours.

2. The richer milk is found to be produced after the shorter interval.

3. Where intervals between milkings are equal, no appreciable difference appears to exist in either the quality or quantity of the milk drawn in the morning or in the evening.

Periods of change in hours of milking are evidently periods of excitement and affect individuals differently.

COW FEEDING EXPERIMENT.

DRY VERSUS WET FEED.

Feeding cows barley, oats and oil meal dry versus bran and gluten meal wet.

As a study of the tables will reveal, the two lots of cows of three each were fed for seven days on similar rations. On the eighth day the rations were changed, both lots being fed ensilage and hay, but lot 1 being given a meal ration of barley, oats and oil meal, fed dry, and lot 2 a meal ration of bran and gluten feed, fed wet. These rations were continued for 14 days, when the rations were interchanged between the lots of cows. The results from equally good rations should with such an interchange of rations have been quite similar. The results show a considerable difference however. As a study of the following tables will show, the ration fed wet gave a daily aggregate of 114 pounds milk testing 3·83 per cent butter fat, equivalent to 4·365 pounds butter fat, while the same cows, fed on the dry ration, gave 116½ pounds milk, testing 3·99 per cent butter fat, equivalent to 4·627 pounds butter fat, an increase of 2½ pounds of milk, of ·16 per cent butter fat, and of ·262 pounds butter fat, an increase of 6 per cent in favour of dry feed.

1. Berkshire Sow (Imp.) 2. Tamworth Sow (Imp.) 3. Berkshire Boar (Imp.)
4. Large Black Boars (Imp.) 5. Large Black Sows (Imp.)

COW FEEDING EXPERIMENT.

Dry Barley, Oats and Oil Meal versus Bran and Gluten fed wet.

	Daily Ration.	Date.	Cows. Julia. Morning. Milk.	Fat.	B. Fat	Julia. Evening. Milk.	Fat.	B. Fat	Begonia. Morning. Milk.	Fat.	B. Fat	Begonia. Evening. Milk.	Fat.	B. Fat	Bell. Morning. Milk.	Fat.	B. Fat	Bell. Evening. Milk.	Fat.	B. Fat	Total for Day. Milk.	Average Fat	Butter Fat.
			Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs.	p. c.	Lbs.
Lot 1 Period 1.	Corn ensilage, 40 lbs.	Oct. 17	14½	3·4	·49	10½	3·4	·35	13½	3.4	·45	10	4·0	·40	14½	3·4	·49	10½	3·8	·39	73½	3·56	2·57
	Clover hay 2 "	" 18	15	3·2	·48	10½	3·6	·37	12½	2.8	·35	10½	4·0	·42	15	3·8	·57	10	4·0	·40	73½	3·56	2·59
	Bran 4 "	" 19	15	3·4	·51	10½	4·0	·42	12½	3·1	·38	11	4·0	·44	15	3·6	·54	10	4·2	·42	74	3·71	2·71
	Oats 1 "	" 20	15	3·3	.49	10½	3·8	·39	12½	2·9	·36	10	4·1	·41	15½	4·0	·62	10	4·4	·44	73½	3·75	2·71
	Gluten 2 "	" 21	15	3·1	·46	10½	3·6	·37	12½	3·2	·40	10½	4·2	·44	15½	3·6	·55	10	4·5	·45	74	3·7	2·67
	Pumpkins 15 "	" 22	15	3·3	·49	10½	3·8	·39	12½	3·1	·38	10	3·9	·39	15½	3 7	·57	10	4·8	·48	73½	3·76	2·70
		" 23	15	3·2	·48	11	3·6	·39	12½	3·5	·43	10½	4·0	·42	15	3·1	·46	10½	4·1	·43	74½	3·58	2·61
	Total	....	104½	3·3	3·40	74	3·7	2·68	88½	3·1	2·75	72½	4·0	2·92	106	3·6	3·80	71	4·3	3·01	516½	3·59	18·56
Lot 1 Period 2.		Oct. 24	15	3·4	·51	11	4·0	·44	12½	3·3	·41	10½	4·2	·44	15½	3·8	·58	10½	4·4	·46	75	3·85	2·84
		" 25	15	3·2	·48	10½	4·0	·42	13	3·3	·42	10	4·1	·41	16	4·0	·64	10½	4·4	·46	75	3·83	2·83
		" 26	15	3·3	·49	10½	3·6	·37	13	3·2	·41	10	4·0	·40	15½	3·8	·58	10½	4·4	·46	74½	3·71	2·71
		" 27	15	3·2	·48	10	3·4	·34	13	2·8	·36	12	4·1	·49	15	3·7	·55	9	3·4	·30	74	3·43	2·52
	Corn ensilage, 40 lbs	" 28	15½	3·2	·49	10½	3·8	·39	13	3·2	·41	11½	3·6	·41	16	3·9	·62	9½	4·2	·39	76	3·65	2·71
	Clover hay 2 "	" 29	15	3·4	·51	10½	3·9	·41	13	2·9	·37	11	4·0	·44	15	3·2	·48	10½	5·0	·52	75	3·73	2·73
	Meal mixture { Barley, 3 lbs	" 30	15	3·4	·51	10½	4·1	·43	13	2·8	·36	10½	4·2	·44	15	3·5	·52	10½	4·6	·48	74½	3·76	2·74
	Oats 4 "	" 31	15	3·6	·54	10½	3·9	·41	12½	3·4	·42	10½	4·4	·46	14½	3·8	·55	10½	3·7	·38	73½	3·8	2·76
	Oil meal 2 "	Nov. 1	15	3·3	·49	10½	4·0	·42	13	3·4	·44	11½	4·3	·49	15	3·6	·54	10	3·9	·39	75	3·75	2·77
	Meal fed dry and all they would stand....	" 2	15	3·4	·51	10½	3·8	·39	13	3·5	·45	11	4·2	·46	14½	3·8	·55	9½	4·4	·41	73½	3·85	2·77
		" 3	14½	3·4	·49	10½	3·6	·37	13	3·0	·39	11	4·2	·46	14½	4·0	·58	9½	4·2	·39	73	3·73	2·68
		" 4	14½	3·4	·49	10½	4·0	·42	13	3·5	·45	11½	4·0	·46	14½	4·2	·60	10	4·4	·44	74	3·91	2·86
		" 5	14½	3·4	·49	11	3 8	·41	13	3·1	·40	11	4·7	·51	14½	4·0	·58	10	4·2	·42	74	3·87	2·81
		" 6	14½	3·6	·52	11	3·4	·37	13	3·4	·44	11½	3·9	·44	15	3·8	·57	10½	3·8	·39	75½	3·66	2 73
	Total	....	208½	3·4	7·00	148	3·8	5·59	181	3·2	5·73	153½	4·1	6·31	210½	3·8	7·94	141	4·2	5·89	1,042½	3·69	38·46

COW FEEDING EXPERIMENT—*Concluded.*

Dry Barley, Oats and Oil Meal versus Bran and Gluten fed wet.

	Daily Ration.	Date.	Cows. Bloom. Morning. Milk.	Fat.	B. Fat	Bloom. Evening. Milk.	Fat.	B. Fat	Della. Morning. Milk.	Fat.	B. Fat	Della. Evening. Milk.	Fat.	B. Fat	Florence. Morning. Milk.	Fat.	B. Fat	Florence. Evening. Milk.	Fat.	B. Fat	Total for Day. Milk.	Average Fat	Butter Fat.
			Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs	p. c.	Lbs	Lbs.	p. c.	Lbs.
Lot 1 Period 3.		Nov. 7	14	3·3	·46	10	3·6	·36	12½	3·0	·37	11	3·4	·37	14½	4·0	·58	9½	4·0	·38	71½	3·71	2·52
		" 8	14½	3·4	·49	10½	3·8	·39	13	2·8	·36	10½	3·4	·35	14½	3·4	·49	10	4·0	·40	73	3·46	2·48
		" 9	14½	3·2	·46	10½	3·8	·39	13	3·0	·39	11	3·9	·42	14	3·6	·50	10	3·6	·36	73	3·51	2·52
		" 10	14	3·2	·44	10	3·8	·38	12	3·0	·36	11	4·0	·44	14	3·6	·50	9½	4·0	·38	70½	3·6	2·50
		" 11	14	3·2	·44	10	3·7	·37	12	3·0	·36	10	4·0	·40	13	3·2	·41	9	3·9	·35	68	3·5	2·33
	Corn ensilage, 40 lbs	" 12	13½	3·1	·41	9½	3·8	·36	12½	3·0	·37	9½	4·0	·38	13	3·4	·44	9	4·3	·38	67	3·6	2·34
	Clover hay 2 "	" 13	13½	3·5	·48	9½	3·8	·36	12½	3·3	·41	10	3·8	·38	13	3·5	·45	10	4·4	·44	68½	3·71	2·52
	Meal mixture { Gluten, 3 lbs	" 14	12½	3·4	·42	9	3·9	·35	12	3·2	·38	9	4·0	·36	11½	4·0	·46	9	4·0	·36	63	3·75	2·33
	{ Bran 5 "	" 15	13	3·4	·44	9	3·8	·34	12½	3·3	·41	9	4·0	·36	12½	4·0	·50	9	3·9	·35	65	3·73	2·40
	Meal fed wet and all they would stand	" 16	12½	3·3	·41	8½	3·6	·30	12	3·2	·38	9	3·8	·34	12½	3·9	·48	8	4·1	·32	62½	3·65	2·23
		" 17	12½	3·0	·37	7½	3·8	·28	12½	3·0	·37	9	3·7	·33	12½	3·6	·45	8	4·0	·32	62	3·51	2·12
		" 18	12	3·1	·37	8½	3·8	·32	12	3·2	·38	9½	3·6	·33	13	3·6	·46	8½	4·0	·34	63½	3·55	2·20
		" 19	12	3·0	·36	8½	3·6	·30	12½	3·1	·38	9	3·7	·33	12½	3·8	·47	8½	4·0	·34	63	3·53	2·18
		" 20	12	3·2	·38	8½	3·6	·30	12½	3·1	·38	9	3·7	·33	12	3·7	·44	8½	4·0	·34	62½	3·55	2·17
	Total		184½	3·2	5·93	129½	3·7	4·80	173½	3·1	5·30	136½	3·8	5·12	182½	3·7	6·63	126½	4·0	5·06	933	3·52	32·84
Lot 2 Period 1.		Oct. 17	10	3·6	·36	7	4·4	·30	10½	4·4	·46	8	4·8	·38	9½	3·6	·34	7	4·2	·29	52	4·16	2·13
	Corn ensilage, 40 lbs	" 18	10	3·8	·38	7½	4·0	·30	10	4·3	·43	8	4·8	·38	10	4·0	·40	7½	4·6	·34	53	4·25	2·23
	Clover hay, 2 "	" 19	10½	3·8	·39	7½	4·4	·33	10	4·4	·44	8	4·8	·38	10	3·8	·38	7½	4·6	·34	53½	4·3	2·26
	Bran, 3 "	" 20	10	4·0	·40	7	4·0	·28	10	4·0	·40	8	5·0	·40	10	3·9	·39	7	4·4	·30	52	4·21	2·17
	Oats, ¾ "	" 21	10½	3·6	·37	6½	4·4	·28	10	4·3	·43	8	5·0	·40	10	4·0	·40	7	4·9	·34	52	4·37	2·22
	Gluten, 1½ "	" 22	9	4·6	·41	6½	4·4	·28	10	4·4	·44	8	5·0	·40	10	4·2	·42	6½	4·8	·31	50	4·56	2·26
	Pumpkins, 15 "	" 23	9	3·8	·35	7	4·0	·28	10	4·3	·43	8	4·6	·36	9	4·0	·36	6½	4·6	·29	49½	4·21	2·07
	Total		69	3·8	2·66	49	4·2	2·05	70½	4·3	3·03	56	4·8	2·70	68½	3·9	2·69	49	4·6	2·21	362	4·23	15·34

Lot 2 Period 2.		Oct. 24	9½	3·8	·36	7	4·0	·28	10	4·3	·43	7½	4·6	·34	9½	3·9	·37	6½	4·4	·28	50	4·16	2·06
		" 25	10½	3·6	·37	7½	4·0	·30	11	3 9	·42	8	4·6	·36	9½	4·0	·38	6½	4·3	·27	53	4·06	2·10
		" 26	10	3·7	·37	7	3·8	·26	11	3·9	·42	7½	4·7	·35	9	4·0	·36	6½	4·4	·28	51	4·08	2·04
		" 27	9½	3·6	·34	6½	3·6	·23	11	3·9	·42	7½	4·4	·33	9½	4·0	·38	5½	6·2	·34	49½	4·28	2·04
	Corn ensilage, 40 lbs	" 28	9	3·6	·32	6½	4·1	·26	11	3·8	·41	7½	4·8	·36	8½	3·9	·33	6½	4·8	·31	49	4·2	1·99
	Clover hay, 2 "	" 29	8½	4·0	·34	6	4·2	·25	10½	4·2	·44	7½	4·4	·33	8	4·4	·36	6½	4·6	·29	47	4·3	2·01
	Meal mixture { Bran, 5 "	" 30	8	3 6	·28	6	4·4	·26	10½	4·0	·42	7	5·0	·35	8	4·0	·32	5½	4·8	·26	45	4·3	1·89
	Gluten 3 "	" 31	8	3·8	·30	6	4·2	·25	10½	4·7	·49	7	5·1	·35	8	4·4	·36	6	4·7	·28	45½	4·48	2·03
	(Meal fed wet and all they would stand.)	Nov. 1	8	4·0	·32	6	4·3	·25	10½	4·4	·46	7	5·0	·35	8½	4·2	·33	6	4·8	·28	46	4·45	1·99
		" 2	8	4·1	·32	8	4·2	·33	10½	4·6	·48	7	4·7	·32	8½	4·4	·37	6	4·4	·26	48	4·4	2·08
		" 3	9½	3·8	·36	8	4·2	·33	10½	4·1	·43	7	4·6	·32	8½	4·2	·33	6	4·9	·29	49½	4·3	2·06
		" 4	8	4·0	·32	6	4·8	·28	10½	4·4	·46	7½	5·0	·37	8½	3·8	·32	6	4·8	·28	46½	4·3	2·03
		" 5	8	4·2	·33	6	4·4	·26	11	4·4	·48	8	5·0	·40	8½	4·1	·34	6½	4·4	·28	48	4·41	2·09
		" 6	8	4·4	·35	6	4·4	·26	11	4·5	·49	8	4·6	·36	9	4·2	·37	6	4·4	·26	48	4·41	2·09
	Total		122½	3·9	4·68	92½	4·2	3·80	149½	4·2	6·25	104	4·5	4·89	121½	4·1	4·92	86	4·7	3·96	676	4·21	28·50
Lot 2 Period 3.		Nov. 7	8	4·2	·33	5½	4·2	·23	10½	4·4	·46	7½	4·6	·34	9	4·4	·39	6	4·6	·27	46½	4·4	2·02
		" 8	7½	4·2	·31	5½	4·2	·23	10½	4·2	·44	7	4·5	·31	9	4·2	·37	6	4·8	·28	45½	4 35	1·94
		" 9	7½	4·4	·33	5	4·2	·21	10½	4·7	·49	7½	5·4	·30	9	4·6	·41	6	5·0	·30	45½	4·71	2·04
	Corn ensilage, 40 lbs	" 10	7	4·5	·31	5	4·9	·24	10	4 7	·47	7	5·1	·35	9	4·4	·39	6	4·8	·28	44	4·73	2·04
	Clover hay 2 "	" 11	7	4·3	·30	5	4·8	·24	10½	4·9	·51	6	5·2	·31	9	4·9	·44	7	4·9	·34	44½	4·83	2·14
	Meal mixture { Barley, 3 "	" 12	7	4·2	·29	5	4·8	·24	8½	4·9	·41	7	5·8	·40	10	5·0	·50	6	5·1	·30	43½	4·96	2·14
	Oats, 4 "	" 13	6½	4·8	·31	4½	4·8	·21	10	4·6	·46	7	5·5	·38	8½	4·5	·38	6	5·0	·30	42½	4·87	2·04
	Oil meal, 2 "	" 14	6	4·2	·25	4½	4·6	·20	8½	4·9	·41	6½	5·4	·35	8	4·3	·34	5½	4·9	·26	39	4·71	1·81
	(Meal fed dry and all they would stand.)	" 15	6	4·1	·24	4½	4·4	·19	9	4·9	·44	6½	5·3	34	8	4·2	·33	5	5·0	·25	39	4·65	1·79
		" 16	6	4·0	·24	3½	4·8	·16	9½	4·8	·45	6½	5·3	·34	8	4·1	·32	5	5·0	·25	38½	4·66	1·76
		" 17	5	3·8	·19	3½	4·9	·17	9½	4·4	·41	6	5·2	·31	8	4·0	·32	5	5·0	·25	37	4·55	1·65
		" 18	5	3·9	·19	3½	4·8	·16	9½	4·5	·42	6½	5·1	·33	8	4·2	·33	5½	5·0	·27	38	4·58	1·70
		" 19	4½	3·9	·17	3	4·9	·14	9½	5·0	·47	7	4·8	·33	8	5·1	·40	5	4·8	·24	37	4·75	1·75
		" 20	4½	3 6	·15	3	4·9	·14	9	4·2	·37	7	4·8	·33	7½	4·2	·31	5	4·9	·24	36	4·43	1·54
	Total		87½	4·1	3·61	61	4·7	2·76	135	4·6	6·21	95	5·1	4·72	119	4·4	5·23	79	4·9	3·83	576½	4·57	26·36

Cows.	Rations Fed.								
	7 days Ensilage, Bran, Oats, Gluten, Pumpkins, Clover Hay.			14 days Ensilage, Clover Hay, Bran, Gluten } fed wet.			14 days Ensilage, Clover Hay, Barley, Oats, Oil Meal } fed dry.		
	Average Milk per day.	Average per cent fat.	Average dy. yield butter fat.	Average Milk per day.	Average per cent fat	Average dy. yield butter fat.	Average Milk per day.	Average per cent fat.	Average dy. yield butter fat.
	lbs.		lbs.	lbs.		lbs.	lbs.		lbs.
Bloom	17	4·0	·68	15½	4·0	·608	10½	4·3	·452
Della	18	4·5	·81	18	4·4	·790	16½	4·8	·792
Florence	17	4·2	·71	15	4·3	·640	14	4·6	·644
Julia	25½	3·4	·86	22½	3·4	·765	26½	3·5	·900
Begonia	23	3·5	·81	22	3·3	·726	24	3·6	·864
Bell	25½	3·8	·97	22	3·8	.836	25	3·9	·975
Total	126	3·84	4·84	114	3·83	4·365	116½	3·99	4·627

DAIRY HERD MILK RECORDS.

That our Canadian dairy cattle are, on the whole, not as profitable as they could be made is well known. That they might and should be the most profitable medium of converting our coarse grains and forage into merchantable produce has long been proven. It is evident, therefore, that as dairymen we should all bend our every energy to the improvement of this condition of affairs.

To preach the doctrine of good dairy bulls has long been the laudable practice of institute workers and agricultural writers. The selection of the best cows goes hand in hand with this, and to determine which animals really are paying all expenses and leaving a profit, a fairly accurate record of the milk produced must be kept.

During the past year an effort has been made to reach a number of our dairymen and get them interested in the keeping of such records. A large number agreed to keep records, and were furnished with blank forms.

Of the value of keeping such a record of the dairy cow, the following opinions are quoted from a few co-operators in various parts of the Dominion.

Uxbridge, Ont. :—'I have been doing the work for 4 years past, and if I did not consider it was an advantage I would not favour continuing the practice. It enables me to cull out the unprofitable cows.'—Jos. E. Gould.

Carlton West, Ont. :—'I would advise all farmers who keep cows to keep a record and learn just what each one is doing for him.'—Edward Adams.

Parry Harbour.—'I have learned a great deal, although for years I have kept a record of every one of my heifers for the first two years. I would advise every farmer to keep a record of what his cows are doing.'—James S. Miller.

Chute a Blondeau.—'By keeping a record of my cows, I have learned a great deal as to the value of the different feeds for milk. I would say to one and all : Keep a record of the cows if you want to find out where your profit comes from.'—D. D. Gray.

St. Emile Junction, Que.—'I most certainly do not regret the few moments employed in this work, which has made me familiar with the powers and qualities of my individual cows.'—C. Bonin.

Halfway Brook, N.S.—'I have learnt to watch the effect of feed on the cows, and thus feed more intelligently. I have obtained a good idea of the value of individual cows. It is well worth the trouble.'—Wm. Hunt.

Kentville, N.S.—'I think this is a good thing if carried out, and no doubt will be a boon to many a farmer throughout the country.'—C. O. Allen.

Bridgetown, N.S.—'It is a very simple and effective means of discovering and proving both the value and capacity of each individual cow, and also the effect of feed. My present feeling in regard to the record is that it is invaluable to any farmer who wishes to make his dairy herd a profitable branch of farming.'—A. Owen Price.

Leduc, N.W.T.—'I am grateful to you for advancing the plan of weighing the milk. I have decided to make it a rule to keep a record of my cows, and would advise all farmers to do likewise. I find it very little extra trouble.'—Robert Duncan.

Penhold, N.W.T.—'I have learnt enough to want to learn more. I know now much more about my cows, and am learning all the time.'—E. Carswell.

Upper Sumas, B.C.—'I believe that the testing of the herd of cows is well worth the labour and time it takes.'—Orion Bowman.

Many letters of a similarly gratifying character have been received, expressing appreciation of the work in helping the dairymen to detect the 'boarder' of the herd, as one man graphically puts it.

It is hoped to extend the list of co-operators and to make the effort at improvement in this line more general. To this end we shall be pleased to send blank forms with full particulars to farmers and dairymen wishing to undertake the work.

MILK TESTING.

During the year the following samples were tested in the dairy at the experimental farm :—

Skim milk	11
Butter-milk	9
Cream	12
Milk	21

The dairyman also tested at the milk factory, L'Ange Gardien, Que., 251 samples of milk and one sample of skim milk, the expenses in connection with this latter work being defrayed by the factory at L'Ange Gardien.

STEER FEEDING EXPERIMENTS.

The experiments with steers during the winter 1900-1 have been along the line of determining the comparative economy (1) of feeding dehorned steers, loose as contrasted with feeding steers not dehorned, tied ; (2) of feeding steers loose, a large number in a box, as contrasted with few in a box ; (3) of feeding steer calves, yearlings, two-year olds, or three-year olds ; (4) of feeding steer calves a limited or growing ration as contrasted with a heavy or fattening ration.

In estimating the cost of feeding steers and calves, the following prices were charged, being the current Ottawa market values of the different materials during the season 1900-01 :—

	Per ton.
Roots, 6 cents per bushel, or	$ 2.00
Ensilage	2.00
Clover hay	6.00
Straw	3.00
Corn	18.00
Oats, pease, or barley	19.00
Bran	15.00
Shorts	16.00
Oil meal	32.00
Gluten meal	16.00
Skim milk, 15 cents per cwt.	3.00
Calf meal, Blatchford's	90.00

During the last two years no experiments have been conducted to gain any further information as to the comparative value of different feeds for the production of beef. The aim in feeding has been to apply information already gained in this line, both here and elsewhere, and investigation has been confined, as indicated above, to the determination of the influence of age and manner of stabling in economy of beef production.

To eliminate as far as possible the influence of individual character in determining the results, groups of nine animals have been used in most cases.

The feeds fed have been mangels, turnips, carrots, ensilage, clover hay, and straw for roughage ; while corn, oats, barley, bran, gluten meal, and oil meal have made up the concentrated or meal ration.

When taken off grass, the steers are fed a roughage ration consisting of turnips, ensilage and clover hay. The feeds are fed in the proportion of, 30 roots, 15 ensilage, 5 hay. The hay is fed long, the roots pulped and mixed with ensilage. The amount fed is measured by the appetite of the animals, care being taken to keep them keen on their feed. As long as good daily gains in weight are secured this ration is continued. As soon as any appreciable lessening in daily rate of increase is observed, a small addition of meal is made to the roughage ration. This change or addition it is found must be made about 5 weeks after stabling. Steers started off in this way do not make phenomenal gains at any time, but are never likely to go 'off feed.' Neither are they likely ever to make gains enough in the day to pay for their keep, save during short intervals, but they are quite likely to keep near the paying point continuously, and thus leave a chance of a profit.

PROFITS IN STEERS.

To say there are great opportunities for making money by feeding steers would be misleading. To condemn the production of beef as a losing business in eastern Canada would be unwise. The farmer with much rough feed and a scarcity of labour will find in well-bred steers a good market for his produce, roughage and grain, at current prices. In addition, the rich manure so plentifully produced is an *invaluable* and *indispensable* and an *imperative* requirement of successful farming in Canada.

The personal factor enters so strongly into the possibility of a profit beyond this that it is impossible to predict the result. The careful buyer and good seller makes a profit where the less business-like man would incur a loss. The studious feeder finds what form of concentrate is the cheapest according to its properties, and uses it ; the careless man uses the handiest or what on the face looks cheapest, while it really may

be the dearest. Every little point requires careful consideration. The keen, broad, business man will make a profit, or at least get good value for his feed. The narrow, niggardly feeder will just as surely sell his feed cheap and work for low wages.

GENERAL STATEMENT.

During the year, steers were fed off to the value of $5,510.18. The cost, November 15th, 1900, was $3,485.40. The increase in value was $2,024.78. The feed cost, at prices quoted above, $1,611.76. The gross cost to produce the beef was, therefore, $5,097.16.

This leaves a net profit of $413.02. The manure quite easily pays for the labour of attending the stock and the wear and tear.

The number of steers fed was 94. Of these, 12 were bought as calves. The net profit per steer was $4.39. This is 5 cents per steer less than last year. Among the steers purchased, however, were 2 which were unthrifty, and after feeding them 2 months it was found necessary to sell them at less than cost.

DIFFERENT AGES.

The experiments with calves, yearlings, two-year olds, and three-year olds are rather interesting, as showing the great advantage of feeding growing animals as contrasted with mature or old animals. The yearlings and two-year olds put on flesh at practically the same cost, while the calves were much more economical as meat producers, and the three-year olds much less economical. The finished product varied in value as follows :—

Calves, $4.50 per 100 lbs. at 1 year old.
Yearlings, $4.77 per 100 lbs., at 2 years old.
Two-year olds, $5 per 100 lbs., at 3 years old.
Three-year olds, $5.12½ per 100 lbs., at 4 years old.

While the cost to put on flesh was as follows :—
Calves, $3.24 per 100 lbs. gain.
Yearlings, $5.77 per 100 lbs. gain.
Two-year olds, $5.71 per 100 lbs. gain.
Three-year olds, $6.37 per 100 lbs. gain.

From a glance at the above, it might be concluded that on all save the calves a loss was incurred. The fact of the case, however, as shown in the records below is that on all there was a profit.

The profit on each lot save the first alone is due to the increased value of the flesh bought. The cost of the various lots being as follows :—
Calves, cost $2.75 per 100 lbs.
Yearlings, cost $3.38 per 100 lbs.
Two-year olds, cost $3.50 per 100 lbs.
Three-year olds, cost $4.25 per 100 lbs.

This shows an increase in value of 100 pounds live weight of flesh purchased in each case as follows :—
Calves, increased value of 100 lbs. by $1.75.
Yearlings, increased value of 100 lbs. by $1.39.
Two-year olds, increased value of 100 lbs. by $1.50.
Three-year olds, increased value of 100 lbs. by 87½ cents.

The apparent break in the gradation of increase of value in live weight is due to the fact of the yearlings being rather small to make profitable shippers, and so having to rank as 'butcher's cattle.'

The average cost to feed one steer in each case was as follows :—

Calf, cost to feed 203 days		$13.80
Yearling	"	18.20
Two-year old	"	18.96
Three-year old	"	22.82

Below are full particulars of each lot in the experiment of feeding at different ages.

CALVES.

Number of steers in lot	5
First weight, gross	1,852 lbs.
First weight, average	370 "
Finished weight, gross	3,903 "
Finished weight, average	780 "
Total gain in 196 days	2,051 "
Average gain per steer	412 "
Daily gain for lot, 5 steers	10·46 "
Daily gain per steer	2·09 "
Gross cost of feed	$ 66.60
Cost of 100 lbs. gain	3.24
Cost of steers, 1,852 lbs. at $2.75 per cwt	50.93
Total cost of beef, $50.93+$66.60	117.53
Value of 3,903 lbs. at $4.50 per cwt.	175.63
Profit on lot	58.10
Net profit per steer	11.62
Average cost price per steer	10.19
Average selling price per steer	35.12
Average increase in value	24.93
Average cost of feed per steer	13.32

YEARLINGS.

Number of steers in lot	9
First weight, gross	7,845 lbs.
First weight, average	873 "
Finished weight, gross	10,680 "
Finished weight, average	1,187 "
Total gain in 203 days	2,835 "
Average gain per steer	315 "
Daily gain for lot, 9 steers	13·96 "
Daily gain per steer	1·55 "
Gross cost of feed	$163 77
Cost of 100 lbs. gain	5 77
Cost of steers, 7,845 lbs. at $3.38 per cwt.	265 00
Total cost to produce beef, $265+$163.77	428 77
Sold 10,147 lbs. at $4.77 per cwt.	483 12
Profit on lot	54 35
Net profit per steer	6 04
Average cost price per steer	29 44
Average selling price per steer	53 68
Average increase in value	24 24
Average cost of feed per steer	18 20

TWO-YEAR OLDS.

Number of steers in lot	9
First weight, gross	8,730 lbs.
First weight, average	970 "
Finished weight, gross	11,720 "
Finished weight. average	1,302 "
Total gain in 203 days	2,990 "
Average gain per steer	332 "
Daily gain for lot, 9 steers	14·23 "
Daily gain per steer	1·58 "
Gross cost of feed	$170 70
Cost of 100 pounds gain	5 71
Cost of steers, 9 at $34	306 00
Total cost to produce beef, $306+$170.71	476 70
Sold 11,134 pounds at $5 per cwt.	556 70
Profit on lot	80 00
Net profit per steer	8 88
Average cost price per steer	34 00
Average selling price per steer	61 85
Average increase in value	27 85
Average cost of feed per steer	18 96

THREE-YEAR OLDS.

Number of steers in lot	9
First weight, gross	10,950 lbs.
First weight, average	1,217 "
Finished weight, gross	14,175 "
Finished weight, average	1,575 "
Total gain in 203 days	3,225 "
Average gain per steer	358 "
Daily gain for lot, 9 steers	15·88 "
Daily gain per steer	1·76 "
Gross cost of feed	$205 41
Cost of 100 lbs. gain	6 37
Cost of steers, 10,403 lbs. at $4.25 per cwt.	437 13
Total cost to produce beef, $437.17+$205.41	642 58
Sold, 13,467 lbs. at $5.12½ per cwt.	690 21
Profit on lot	47 63
Net profit per steer	5 29
Average cost price per steer	48 57
Average selling price per steer	76 69
Average increase in value	28 12
Average cost of feed per steer	22 82

TIED VERSUS LOOSE.

As it is impossible to speak positively from one experiment along any given line, it was decided to continue the Tied *versus* Loose feeding test for several years.

In the record of the experiments conducted along this line last year, as shown in the report for 1900, page 75, the steers fed tied did better than those fed loose. This year the results show a margin in favour of the steers fed loose as contrasted with a similar lot fed tied. The steers in the various experiments were sold to go

June 3, 1901. Up till May the records of the two lots showed a margin in favour of the tied steers, but from that date till the shipping day, June 3, the loose steers kept gaining on the tied steers, till they stood, as indicated in the records which follow :—

Not Dehorned, Tied (3 years old.)

Number of steers in lot	9
First weight, gross	10,171 lbs.
First weight, average	1,130 "
Finished weight, gross	13,285 "
Finished weight, average	1,476 "
Total gain in 203 days	3,114 "
Average gain per steer	346 "
Daily gain for lot of 9 steers	15·34 "
Daily gain per steer	1·70 "
Gross cost of feed	$205 41
Cost of 100 pounds gain	6 60
Cost of steers, 9,663 pounds at $4.25 per cwt.	410 68
Total cost to produce beef, $410.68+$205.41	616 09
Sold, 12,621 pounds at $5.12½ per cwt.	646 20
Profit on lot	30 11
Net profit per steer	3 34
Average cost per steer	45 63
Average selling price per steer	71 80
Average increase in value	26 17
Average cost of feed per steer	22 82

Dehorned, Loose (3-year olds).

Number of steers in lot	9
First weight, gross	10,583 lbs.
First weight, average	1,175 "
Finished weight, gross	13,845 "
Finished weight, average	1,538 "
Total gain in 203 days	3,262 "
Average gain per steer	363 "
Daily gain of lot of 9 steers	16·07 "
Daily gain per steer	1·78 "
Gross cost of feed	$213 74
Cost of 100 pounds gain	6 55
Cost of steers, 10,054 pounds at $4.25 per cwt.	427 29
Total cost to produce beef, $427.29+$213.74	641 03
Sold, 13,153 pounds at $5.12½ per cwt.	674 09
Profit on lot	33 06
Net profit per steer	3 67
Average cost price per steer	47 47
Average selling price per steer	74 90
Average increase in value	27 43
Average cost of feed per steer	23 75

LARGE *versus* SMALL LOTS, LOOSE.

As indicated in last year's report, an experiment to gain some information as to the advisability of feeding few or many steers together, loose, has been tried. The data obtained from this experiment would indicate that 6 was the most suitable num-

ber to feed loose together, but a study of the individuals composing the different lots seemed to show that the character of the separate steers, as good or bad feeders, was an important factor in determining the final standing.

The fact of a steer being a 'good feeder,' or a 'bad feeder,' frequently affects very seriously the accuracy of the results. The buyer can in selecting feeders usually reject such as are likely to be 'bad doers,' or 'bad feeders.' It is, however, not always possible to single out the prospective, bad feeder, and rather poor doers are not always possible of detection. The difficulty is further increased when it comes to the question of selecting a large number of steers which shall make equal gains under similar treatment.

When a large number of animals is used in each lot, the individuality of the animals is in a measure overcome, and the larger the number, the less allowance is necessary for extra good or rather poor animals. Therefore, where differences in the number of animals fed together are the main feature of the experiment, it is quite evident that individual quality must be of more importance in the small lots than in the large.

Considering the above, the experiment may not be of any great value, but the subtended results are given for what they are worth :—

Dehorned, Loose (3-year olds.)

Number of steers in lot	9
First weight, gross	10,583 lbs.
First weight, average	1,175 "
Finished weight, gross	13,845 "
Finished weight, average	1,538 "
Total gain in 203 days	3,262 "
Average gain per steer	363 "
Daily gain for lot of 9 steers	16·07 "
Daily average per steer	1·78 "
Gross cost of feed	$213 74
Cost of 100 pounds gain	6 55
Cost of steers, 10,054 lbs. at $4.25 per cwt.	427 29
Total cost to produce beef, $427.29+$213.74	641 03
Sold, 13,153 lbs. at $5.12½ per cwt.	674 09
Profit on lot	33 06
Net profit per steer	3 67
Average cost price per steer	47 47
Average selling price per steer	74 90
Average increase in value	27 43
Average cost of feed per steer	23 75

Dehorned, Loose (3-year olds.)

Number of steers in lot	6
First weight, gross	6,593 lbs.
First weight, average	1,099 "
Finished weight, gross	8,770 "
Finished weight, average	1,461 "
Total gain in 203 days	2,177 "
Average gain per steer	363 "
Daily gain for lot of 6 steers	10·72 "
Daily gain per steer	1:79 "

Dehorned, Loose (3-year olds)—Concluded.

Gross cost of feed	$136 09
Cost of 100 pounds gain	6 25
Cost of steers, 6,264 pounds at $4.25 per cwt.	266 22
Total cost to produce beef, $266.22+$136.09	402 31
Sold, 8,332 pounds at $5.12½ per cwt.	427 01
Profit on lot	24 70
Net profit per steer	4 11
Average cost price per steer	44 37
Average selling price per steer	71 16
Average increase in value	26 79
Average cost of feed per steer	22 68

Dehorned, Loose (3-year olds.)

Number of steers in lot	3
First weight, gross	3,430 lbs.
First weight, average	1,143 "
Finished weight, gross	4,470 "
Finished weight, average	1,490 "
Total gain in 203 days	1,040 "
Average gain per steer	346 "
Daily gain for lot of 3 steers	5·12 "
Daily gain per steer	1·70
Gross cost of feed	$ 70 30
Cost of 100 pounds gain	6 76
Cost of steers, 3,259 pounds at $4.25 per cwt.	138 51
Total cost to produce beef, $138.51+$70.30	208.81
Sold, 4,247 lbs. at $5.12½ per cwt.	217 66
Profit on lot	8 85
Net profit per steer	2 95
Average cost price per steer	46 17
Average selling price per steer	72 55
Average increase in value	26 38
Average cost of feed per steer	23 43

STEER CALF EXPERIMENTS.

The experiment started last year with 10 steer calves has been continued, and below is a detailed statement of the feed, gains, and cost for the year.

The experiment is being repeated, and 10 steer calves have again been selected and started out. The rations have not been exactly similar with those of 1900, but the variation is small.

No comment on, or close study of these experiments will be made till several series have been completed. The data submitted will speak for themselves.

The aim is to determine the comparative economy of feeding calves a full fattening ration from the start as contrasted with a limited growing ration.

May Calves, *1901.*

EXPERIMENT II, CALVES—FULL FATTENING RATION.

Week ending	Milk.	Oats.	Corn.	Oil Meal.	Calf Meal.	Bran.	Shorts.	Pease.	Roots.	Ensilage.	Straw.	Hay.
May 25	245	$17\frac{1}{2}$	$4\frac{6}{16}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	.....
June 1	350	$17\frac{1}{2}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	.....
" 8	350	$17\frac{1}{2}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	.....
" 15	350	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	$17\frac{1}{2}$
" 22	350	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	$17\frac{1}{2}$
" 29	350	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	$17\frac{1}{2}$
July 6	350	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$17\frac{1}{2}$	.....	.....	.....	.....	.....	$17\frac{1}{2}$
" 13	525	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$6\frac{9}{16}$	$17\frac{1}{2}$	$17\frac{1}{2}$	.....	.....	.....	.....	$17\frac{1}{2}$
	2,870	140	46	46	46	140	$17\frac{1}{2}$	.....	.....	.....	.....	88
July 20	525	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	.....	$17\frac{1}{2}$	$17\frac{1}{2}$	.....	.....	.....	.....	$17\frac{1}{2}$
" 27	525	$17\frac{1}{2}$	$6\frac{9}{16}$	$6\frac{9}{16}$	.....	$17\frac{1}{2}$	$17\frac{1}{2}$	.....	.....	.....	.....	$17\frac{1}{2}$
Aug. 3	525	$17\frac{1}{2}$	$17\frac{1}{2}$	$6\frac{9}{16}$	.....	$17\frac{1}{2}$	.....	.....	.....	35	.....	35
" 10	525	$17\frac{1}{2}$	$17\frac{1}{2}$	$6\frac{9}{16}$	.....	$17\frac{1}{2}$	.....	.....	.....	35	.....	35
" 17	525	$17\frac{1}{2}$	$17\frac{1}{2}$	$6\frac{9}{16}$	.....	$17\frac{1}{2}$	.....	.....	.....	35	.....	35
" 24	525	35	35	$17\frac{1}{2}$	.....	$17\frac{1}{2}$	.....	.....	.....	105	.....	35
" 31	525	35	35	$17\frac{1}{2}$	.....	$17\frac{1}{2}$	.....	.....	.....	105	.....	35
Sept. 7	525	35	35	$17\frac{1}{2}$	.....	$17\frac{1}{2}$	.....	.....	.....	105	.....	35
	4,200	192	171	85	.....	140	35	.....	.....	420	.....	245

EXPERIMENT II, CALVES—FULL FATTENING RATION.

Week ending	Milk.	Oats.	Corn.	Oil Meal.	Bran.	Ensilage.	Hay.	Roots.
September 14	525	35	35	$17\frac{1}{2}$	$17\frac{1}{2}$	105	35	.....
" 21	525	35	35	$17\frac{1}{2}$	$17\frac{1}{2}$	105	35	.....
" 28	525	35	35	$17\frac{1}{2}$	$17\frac{1}{2}$	105	35	.....
October 5	.....	35	35	$17\frac{1}{2}$	$17\frac{1}{2}$	140	35	.....
" 12	.....	35	35	$17\frac{1}{2}$	$17\frac{1}{2}$	175	35	.....
" 19	.....	35	35	$17\frac{1}{2}$	$17\frac{1}{2}$	175	35	.....
" 26	.....	35	35	$17\frac{1}{2}$	35	350	35	.....
November 2	.....	35	35	$17\frac{1}{2}$	35	525	35	.....
" 9	.....	35	$52\frac{1}{2}$	$17\frac{1}{2}$	35	700	35	175
" 16	.....	35	$52\frac{1}{2}$	$17\frac{1}{2}$	35	700	35	175
" 23	.....	35	$52\frac{1}{2}$	$17\frac{1}{2}$	35	875	35	175
" 30	.....	35	$52\frac{1}{2}$	$17\frac{1}{2}$	35	875	35	175
	1,575	420	490	210	315	4,830	420	700

EXPERIMENT II, CALVES—LIMITED GROWING RATION.

Week ending	Milk.	Oats.	Corn.	Oil Meal.	Barley.	Bran.	Shorts.	Pease.	Roots.	Ensilage.	Straw.	Hay.
May 25	175	17½	.....	4⅜	......	17½	.....	.. ..	... .	......	......	17½
June 1	175	17½	......	4⅜	....	17½	......	......	......	... .	......	17½
" 8	175	17½	.. ..	4⅜	.. . .	17½	......	......	.. .	....	.....	17½
" 15	245	17½	......	4⅜	......	17½	......	.. ...	....	.....	......	17½
" 22	350	17½	......	4⅜	.....	17½	.....	......	.. ..	.....	......	17½
" 29	350	17½	. ..	4⅜	......	17½	. ...	......	.....	. ..	.....	17½
July 6	525	17½	.....	4⅜	......	17½	......	......	......	......	.. .	17½
" 13	525	17½	. .	4⅜	......	17½	....	......	......	......	......	17½
	2,520	140	......	35	......	140	......	......	......	.. ..	......	140
July 20	525	17½	......	4⅜	....	17½	17½	......	......	...	......	17½
" 27	525	17½	......	4⅜	......	17½	17½	.....	......	. ....	......	17½
Aug. 3	525	17½	......	4⅜	......	17½	17½	.....	......	35	......	35
" 10	525	17½	.....	4⅜	......	17½	17½	.....	......	35	......	35
" 17	525	17½	......	4⅜	......	17½	17½	......	....	35	......	35
" 24	525	17½	......	17½	.....	35	35	......	....	105	......	35
" 31	525	17½	......	17½	......	35	35	......	......	105	......	35
Sept. 7	525	17½	......	17½	......	35	35	......	......	105	......	35
	4,200	140	......	74	.....	192	192	......	......	420	......	245

Week ending	Milk.	Oats.	Barley.	Bran.	Shorts.	Ensilage.	Hay.	Roots.
September 14	525	17½	17½	35	35	105	35	....
" 21	525	17½	17½	35	35	105	35	....
" 28	525	17½	17½	35	35	105	35	....
October 5	....	17½	17½	35	35	175	35	....
" 12	....	17½	17½	35	35	175	35	.. ..
" 19	....	17½	17½	35	35	350	35	....
" 26	....	17½	17½	35	35	525	35	....
November 2	....	17½	17½	35	....	700	35	....
" 9	....	17½	....	35	....	700	35	175
" 16	....	17½	....	35	....	875	35	175
" 23	....	17½	....	17½	....	875	70	350
" 30	....	17½	....	17½	....	875	70	350
	1,575	210	110	385	245	5,565	490	1,050

EXPERIMENT II., CALVES—SUMMARY—LOT II. FULL FATTENING RATION.

Period.	Total Gain of Lot.	Daily Rate of Gain per Steer.	Cost to Feed Lot.	Cost of 1 pound Gain.	Cost to Feed 1 Steer 1 day.	Weight at beginning of period.	Remarks.
	Lbs.	Lbs.	$ cts.	Cts.	Cts.	Lbs.	
1st of 8 weeks	582	2·08	9 60	1·65	3·43	468	May 29.
2nd of 8 weeks	515	1·84	13 32	2·58	4·94	1,050	
3rd of 12 weeks	650	1·55	22 78	3·50	5·42	1,565	
Average or aggregate	1,747	1·92	45 70	2·60	5·02	2,215	Final weight.

EXPERIMENT II., CALVES—SUMMARY—LOT I. LIMITED GROWING RATION.

Period.	Total Gain of Lot.	Daily Rate of Gain per Steer.	Cost to Feed Lot.	Cost of 1 pound Gain.	Cost to Feed 1 Steer 1 day.	Weight at beginning of period.	Remarks.
	Lbs.	Lbs.	$ cts.	Cts.	Cts.	Lbs.	
1st 8 weeks	530	1·89	7 14	1·35	2·55	475	
2nd 8 weeks	530	1·89	12 95	2·44	4·62	1,005	
3rd 12 weeks	491	1·17	18 61	3·79	4·43	1,535	
Average or aggregate	1,551	1·68	38 70	2·49	3·95	2,026	Final weight.

Calves, May, 1900.

EXPERIMENT I—LIMITED GROWING RATION.

Period Week ending	Oats.	Barley.	Bran.	Shorts.	Roots.	Ensilage.	Hay.	Straw.
December 8	35	17½	35	17½	175	140	35	....
" 15	35	17½	35	17½	315	280	35	....
" 22	35	17½	35	17½	350	315	35	....
" 29	35	....	17½	17½	490	455	35	....
January 5	17½	....	17½	17½	525	525	35	....
" 12	17½	....	17½	....	350	525	35	....
" 19	17½	....	....	....	875	525	35	....
" 26	....	....	....	....	700	700	35	35
	192½	52½	157½	87½	3,780	3,465	280	35

Period Week ending	Roots.	Ensilage.	Straw.	Hay.
February 2	875	700	35	35
" 9	700	700	35	35
" 16	700	700	35	35
" 23	875	875	35	35
March 2	875	875	35	35
" 9	875	875	35	35
" 16	525	1,225	35	35
" 23	525	1,225	35	35
	5,950	7,175	280	280

LIMITED GROWING RATION.

Period Week ending	Roots.	Ensilage.	Straw.	Hay.
March 30	525	1,225	35	35
April 6	525	1,225	35	35
" 13	....	1,400	35	35
" 20	....	1,400	35	35
" 27	350	1,225	35	35
May 4	350	1,225	35	35
" 8	150	525	35	35
	1,900	8,225	245	245

Period Week ending	Roots.	Ensilage.	Hay.	Pasture.
November 16	....	....	....	30 mos.
" 23	350	1,225	70	....
" 30	350	1,225	70	....
	700	2,450	140	30 mos.

EXPERIMENT I—FULL FATTENING RATION.

Week ending	Oats.	Corn.	Oil Meal.	Bran.	Gluten.	Roots.	Ensilage.	Hay.
Dec. 8	35	....	35	35	....	105	140	35
" 15	35	35	....	35	....	210	175	35
" 22	35	35	....	35	....	315	280	35
" 29	35	35	17½	35	....	455	420	35
1901.								
Jan. 5	35	35	17½	35	....	490	420	35
" 12	35	35	17½	35	....	490	455	35
" 19	35	35	17½	17½	....	700	630	35
" 26	35	35	17½	17½	....	700	630	35
	280	245	122½	245	....	3,465	3,150	280

FULL FATTENING RATION.

Week ending	Oats.	Corn.	Oil Meal.	Bran.	Gluten.	Roots.	Ensilage.	Straw.	Hay.
Feb. 2	52½	35	17½	17½	....	700	630	35	35
" 9	52½	35	17½	17½	....	700	630	35	35
" 16	52½	35	17½	17½	....	700	700	35	35
" 23	17½	....	17½	17½	35	700	875	35	35
Mar. 2	17½	....	17½	35	35	700	875	35	35
" 9	17½	....	17½	35	35	700	875	35	35
" 16	17½	....	17½	35	35	700	875	35	35
" 23	17½	....	17½	35	35	700	875	35	35
	245	105	140	210	175	3,500	6,335	280	280

FULL FATTENING RATION.

Week ending	Oats.	Gluten.	Oil Meal.	Bran.	Roots.	Ensilage.	Straw.	Hay.
March 31	17½	35	17½	35	700	875	35	35
April 6	17½	35	17½	35	700	875	35	35
" 3	35	35	17½	35	700	875	35	35
" 20	35	52½	17½	35	700	875	35	35
" 27	35	52½	35	35	525	1,050	35	35
May 4	35	52½	35	35	525	1,050	35	35
" 11	35	52½	35	35	525	1,050	35	35
" 18	35	52½	35	35	....	1,225	35	35
	245	367½	210	280	4,375	7,875	280	280

FULL FATTENING RATION.

Week ending	Oats.	Corn.	Oil Meal.	Bran.	Ensilage.	Straw.	Hay.	Green Feed.
May 25	35	70	35	35	1,225	35	35	
June 1	35	70	35	35	1,225	35	25	
" 8	35	70	35	35	1,225	....	70	
" 15	35	70	35	35	1,225	....	105	
" 22	35	70	35	35	1,225	....	105	
" 29	35	70	35	35	1,225	....	105	
July 6	35	70	35	35	1,225	....	35	Pasture.
" 13	35	70	35	35	1,225	....	35	Pasture.
	280	560	280	280	9,800	70	525	

FULL FATTENING RATION.

Week ending	Oats.	Corn.	Oil Meal.	Bran.	Ensilage.	Hay.	Green Feed.	Gluten.	Roots.
July 20	52½	70	35	35	1,050	35	Pasture at night on a small lot, 1 acre.		
" 27	52½	70	35	35	1,700	35			
August 3	52½	70	35	35	525	35			
" 10	52½	70	35	35	525	35			
" 17	52½	70	35	35	525	35			
" 24	70	105	35	35	525	35			
" 31	70	105	35	35	525	35			
September 7	70	105	35	35	525	35			Pasture on one acre lot for six weeks.
" 14	70	105	35	35	525	70			
" 21	70	105	35	35	525	70			
" 28	70	105	35	35	525	70			
October 5	70	105	35	35	525	70			
" 12	70	105	35	35	700	70			
" 19	70	....	35	35	700	70	....	122½	
" 26	70	....	52½	35	1,050	70	....	122½	
November 2	70	....	52½	35	1,050	70	....	122½	175
" 9	70	....	52½	35	1,050	70	....	122½	350
" 16	70	....	52½	35	1,225	70	....	122½	350
" 23	70	....	52½	35	1,225	70	....	122½	350
" 30	70	....	52½	35	1,225	70	....	122½	525
	1,202½	1,190	805	700	15,125	1,120	....	857½	1,750

EXPERIMENT I—SUMMARY FOR 1901—LOT I. LIMITED GROWING RATION.

Period.	Total Gain of Lot.	Daily Rate of Gain per Steer.	Cost to Feed Lot.	Cost of 1 pound Gain.	Cost to Feed 1 Steer 1 day.	Weight at beginning of Period.
	Lbs.	Lbs.	$ cts.	Cents.	Cents.	Lbs.
1st, 8 weeks	325	1·16	12 37	3·80	4·42	1,885
2nd, 8 "	295	1·05	14 38	4·87	5·14	2,210
3rd, 7 "	120	0·45	11 22	9·35	4·58	2,505
4th, 6 months	1,210	1·10	30 00	2·48	3·33	2,625
5th, 2 weeks	140	2·00	3 57	2·55	4·00	3,835
Statement for year	2,090	1·14	71 54	3·42	3·92	3,975*

* Weight, November 30, 1901.

EXPERIMENT I.—SUMMARY FOR 1901—LOT II. FULL FATTENING RATION.

Period.	Total Gain of Lot.	Daily Rate of Gain per Steer.	Cost to Feed Lot.	Cost of 1 pound Gain.	Cost to Feed 1 Steer 1 day.	Weight at beginning of Period.
	Lbs.	Lbs.	$ cts.	Cents.	Cents.	Lbs.
1st, 8 weeks........	660	2·35	16 10	2·44	5·75	2,165
2nd, 8 "	609	2·17	19 40	3·14	6·92	2,825
3rd, 8 "	469	1·67	24 25	5·17	8·66	3,434
4th, 8 "	467	1·67	27 75	5·94	9·91	3,903
5th, 8 "	320	1·14	24 75	7·73	8·84	4,370
6th, 12 "	935	2·22	45 60	4·87	10·85	4,690
Statement for year......	3,460	1·9	157 75	4·55	8·53	5,625*

*Weight November 30, 1901.

SHEEP.

The breeding flocks include the following animals of the Shropshire and Leicester breeds :—

Shropshires :—

1 ram (imp.), 18 months old.
1 ram lamb, 6 months old.
2 ewes (imp., 1899), 2½ years old.
2 ewes, 2½ years old.
5 ewes (imp., 1901), 1½ years old.
4 ewe lambs (imp., 1901), 8 months old.
3 ewe lambs, home bred, 6 months old.

Leicesters :—

1 ram lamb, 'Stanisson,' 8 months old.
1 ewe, 5½ years old.
3 ewes, 4½ years old.
2 ewes, 2½ years old.
2 ewes, 1½ years old.
2 ewe lambs, 6 months old.

Besides the above, there are three grades which are being experimented upon for breeding purposes.

The lamb crop the past spring was not so good as that for 1900, but the lambs have done much better during the past summer, and a number of good animals have been sold or retained for breeding purposes.

Several of the best Shropshire flocks in Great Britain were visited during the summer. At Mr. Minton's annual ram sale one of the top shearling rams was secured.

From the famous flock of Mr. Mansell were secured 5 shearling ewes and 4 ewe lambs. These, it is hoped, may constitute the foundation of a good flock.

The Leicester ram, Stanisson, was secured from Mr. A. W. Smith, Maple Lodge, Ont. He was a winner at the Pan-American Exposition, Buffalo, this year.

As in preceding years, the sheep were pastured on a small, stony field. This was supplemented by rape and some clover.

RAPE FOR SHEEP.

The use of rape as a pasture for sheep and lambs cannot be too highly commended. There are, however, two or three dangers to be guarded against. In the first place, care must be taken that the sheep do not enter the rape when very hungry, especially is there danger in this when the leaves are for any reason wet. The effect to be feared is 'bloating.'

Rape is, as indicated in the report for 1900, very rich in protein, much richer than most other forage plants, as the proportion of protein to carbo-hydrates is about 1 to 1:8. This is much too great a proportion of protein, and where sheep, or more particularly, lambs are confined to this feed they soon show signs of some injurious influence at work. A sleepiness is first observed, which later is followed by a weakness of the limbs and the sudden falling of the animal. It is, then, very difficult indeed to put them in good condition again. Of course, it is easy to avoid this trouble by letting the lambs have another pasture part of the day. For such a purpose a hill pasture or some pasture carrying but little clover is to be preferred.

SWINE.

There are on the farm at present four herds of pure-bred swine. They are made up as follows :—

Berkshires :—

1 boar (imp., 1901), 8 months old.
1 boar, 'Bobby,' 6 months old.
1 sow (imp., 1901), 1 year old.
2 sows, 1½ years old.

Large Improved Yorkshires :—

1 boar, 1½ years old.
5 sows, 1½ to 3 years old.
1 sow (imp., 1901), 1 year old.
1 sow, 9 months old.

Tamworths :—

1 boar, 'Hero,' 15 months old.
2 sows, 2 years old.
1 sow (imp., 1901), 1 year old.

Large Blacks :—

2 boars (imp., 1901), 6 months old.
2 sows (imp., 1901), 6 months old.

The imported pigs were secured from the most famous herds in England. The Yorkshire sow came from Sanders Spencer, Esq., St. Ives, Hunts ; the Berkshires, from Philo L. Mills, Esq., Ruddington Manor, Notts ; the Tamworth, from D. W. Phillips, Esq., The Ashes, Whiteacre, Birmingham.

The large Blacks seem to be slowly coming into prominence in England. The individuals are of the bacon type, but rather coarse. Some experimental work will be done with them here to test their value as an addition to our bacon breeds. An effort will be made to determine their value for crossing with some of the other breeds of pigs.

The breeding pigs during the past year have done only fairly well. The spring litters were rather late, which, of course, influenced the date of the fall litters.

During the season about 40 pigs have been sold for breeding purposes, and the rest of the young pigs sold for pork.

PORK PRODUCTION.

A large number of pigs have been fed during the year, but particular reports can be given of 4 lots only.

In each case the meal mixture fed consisted of one-half corn, the other half oats, pease and barley, equal parts. In addition, each pig was given 3 lbs. of milk daily and all the roots they would consume, as follows :—

Lot 1.—Turnips fed pulped.
Lot 2.—Mangels fed pulped.
Lot 3.—Sugar beets grown for forage fed pulped.
Lot 4.—Sugar beets grown for sugar production fed pulped.

Lot 1.—Meal, Milk, Turnips.

Number of pigs in test	4
Aggregate weight, January 7	405 lbs.
Average weight January 7	101 "
Aggregrate weight April 23	768 "
Average weight April 23	192 "
Aggregate gain	363 "
Average gain	91 "
Daily rate of gain per pig for 106 days	·85 "
Pigs ate 780 lbs. meal at 90 cents per cwt.	$ 7 02
" 3,808 lbs. mangels at 10 cents per cwt.	3 81
" 1,284 lbs. skim milk at 20 cents per cwt.	2 57
Total	$13 40
Cost to produce pork was :—	
405 lbs. feeders at $7 per cwt.	$28 35
Food consumed	13 40
Total cost	$41 75
Sold 768 lbs. pork at $6 per cwt.	$46 08
Profit on lot of 4 pigs	4 33
Cost to produce 100 lbs. increase live weight	3 69

Buyer's report :—

4 pigs, all 'select.'

Packer's report on carcasses :—

No. 312 weighed alive 197 lbs. ; dressed, 133 lbs. ; graded, 'good, firm.'
No. 313 weighed alive 197 lbs. ; dressed, 135 lbs. ; graded, 'hard, firm.'
No. 314 weighed alive 189 lbs. ; dressed, 126 lbs. ; graded, 'hard, firm.'
No. 315 weighed alive 185 lbs. ; dressed, 121 lbs. ; graded, 'good, firm.'

Lot 2.—Meal, Milk, Mangels.

Number of pigs in test	4
Aggregate weight January 7	377 lbs.
Average weight January 7	94 "
Aggregate weight April 23	766 "
Average weight April 23	191 "
Aggregate gain	389 "
Average gain	97 "
Daily rate of gain per pig, 106 days	·90 "

Pigs ate 786 lbs. meal at 90 cents per cwt.	$ 7 07
" 5,930 lbs. mangels at 10 cents per cwt.	5 93
" 1,284 lbs. skim milk at 20 cents per cwt.	2 07
Total	$15 57

Cost to produce pork was :—

377 lbs. feeders at $7 per cwt.	$26 39
Food consumed	15 57
Total cost	$41 96
Sold 766 lbs. pork at $6 per cwt.	$45 96
Profit on lot of 4 pigs	4 00
Cost to produce 100 lbs. increase live weight	4 00

Buyer's report :—

4 pigs, all 'select.'

Packer's report on carcasses :—

No. 319 weighed alive 195 lbs. ; dressed, 135 lbs. ; graded, 'good, firm.'
No. 317 weighed alive 195 lbs. ; dressed, 138 lbs. ; graded, 'good, firm.'
No. 318 weighed alive 182 lbs. ; dressed, 125 lbs. ; graded, 'good, firm.'
No. 319 weighed alive 194 lbs. ; dressed, 131 lbs. ; graded, 'good, firm.'

Lot 3.—Meal, Milk, Forage Sugar Beets.

Number of pigs in test	4
Aggregate weight January 7	307 lbs.
Average weight January 7	77 "
Aggregate weight April 23	807 "
Average weight April 23	202 "
Aggregate gain	500 "
Average gain	125 "
Daily rate of gain per pig, 106 days	1·18 "

Pigs ate 793 lbs. meal at 90 cents per cwt.	$ 7 13
" 4,298 lbs. sugar beets at 15 cents per cwt.	6 44
" 1,284 lbs. skim milk at 7 cents per cwt.	2 57
Total	$16 14

Cost to produce pork was :—

307 lbs. feeders at $7 per cwt.	$21 49
Food consumed	16 14
Total cost	$37 63
Sold 807 lbs. pork at $6 per cwt.	$48 42
Profit on lot of 4 pigs	10 79
Cost to produce 100 lbs. increase live weight	3 22

Buyer's report :—

3 pigs 'select,' 1 pig 'fat.'

Packer's report on carcasses :—

No. 320 weighed alive 175 lbs. ; dressed, 118 lbs. ; graded, 'medium, a little too thin.'

No. 321 weighed alive 218 lbs. ; dressed, 155 lbs. ; graded, 'very good, a little too fat.'

No. 322 weighed alive 187 lbs. ; dressed, 130 lbs. ; graded 'very fair.'

No. 323 weighed alive 227 lbs. ; dressed, 157 lbs. ; graded, 'very firm, right thickness of fat.'

Lot 4.—Meal, Milk, Sugar Beets (Special Culture.)

Number of pigs in test	4
Aggregate weight January 7	228 lbs.
Average weight January 7	57 "
Aggregate weight May 25	754 "
Average weight May 25	188 "
Aggregate gain	528 "
Average gain	132 "
Daily rate of gain per pig for 138 days	·95 "

Pigs ate 1,032 lbs. meal at 90 cents per cwt.	$ 9 29
" 4,266 lbs. sugar beets at 15 cents per cwt.	6 39
" 1,680 lbs. skim milk at 20 cents per cwt.	3 36
Total	$19 04

Cost to produce pork was :—

228 lbs. feeders at $7 per cwt.	15 96
Food consumed	19 04
Total cost	$35 00

Sold 754 lbs. pork at $6 per cwt.	$45 24
Profit on lot of 4 pigs	10 24
Cost to produce 100 lbs. increase live weight	3 60

Buyer's report :—

4 pigs, all 'select.'

No packer's report on carcasses.

During the past three years a large number of pigs have been fed in this department to determine, if possible, the influences affecting that quality of pork commonly known as 'firmness.'

THE SOFT PORK PROBLEM.

The series of experiments were planned by Mr. F. T. Shutt, the chemist, and myself, and each carcase examined for firmness by one or both of us. For several reasons it could not, on the whole, be made an experiment in comparative economy of feeding for the various rations. A number of lots have been reported on in this respect, however, in the reports for 1899-1900, as well as in this year's report.

To give some idea of the scope of the experimental feeding carried on, I may say that the following influences were studied in their effect upon the quality of the finished product :—

1. Eastern or Ottawa district pigs as contrasted with western or St. Clair district pigs when fed similarly.

2. Pigs, outside in roomy lots, as contrasted with pigs in cramped quarters, under cover, fed similar rations.

3. Preparation of feed, as feeding similar lots similar feed, dry, soaked, or cooked, ground in each case.

4. Supply of feed, a limited, as contrasted with an unlimited supply of similar feed fed in a similar manner.

5. Feeding one kind of feed from beginning to end of experiment, as contrasted with feeding similar feed during first period, or up to 100 pounds live weight, then changing to a different feed, and the reverse of this.

6. Different feeds, oats, pease, barley, Indian corn, shorts, beans, skim milk, rape, clover pasture, steamed clover, mangels, turnips, sugar beets, pumpkins, artichokes.

These were fed separately or in mixtures of different proportions prepared as indicated above.

To neglect individual and group results (a full report of which may be found in Bulletin No. 38), I may say that the experiments seem to point to the following conclusions :—

1. Locality whence pigs come has apparently no influence on firmness.

2. Opportunity of exercise as afforded by a large run does not appear to materially affect firmness.

3. Neither cooked nor soaked feed has any superiority over dry feed as a producer of firm bacon.

4. Feeding a large rather than a limited or small ration is not likely to affect firmness.

5. Kind of feed determines the kind of bacon, health being good.

(*a*) Indian corn produces soft pork, unless fed in small quantities or with skim milk (or whey).

(*b*) The greater the proportion of Indian corn in the ration, the softer is the pork likely to be.

(*c*) Oats, pease and barley in equal parts make up an excellent ration for the production of firm pork.

(*d*) Skim milk is without a peer as part of any ration for the production of firm pork.

(*e*) Rape, pumpkins, artichokes, sugar beets, turnips, and mangels may be expected to have no injurious effects upon the firmness of the pork product when fed with an otherwise good ration.

6. General good health and thrift are important for the production of firm bacon. Skim milk added to any grain or succulent ration will add to the thrift of the animals. A fairly roomy yard, pen or run is conducive to good health and thrift.

SOIL CULTIVATION.

That our arable soils have undergone a great change since the first settlers stirred their fertile depths, I am sure the most conservative will admit ; that the change has been for the better only too few have any ground for asserting ; on the contrary, almost every farmer whose memory goes back twenty, or even ten years will agree that our crops to-day in any of the eastern provinces are not, as a rule, what they used to be, and the question naturally comes, why this falling off in returns, even from the fields of many of our best farmers ? It may be answered that the causes are various. Yet they seem to be included in the lack of one marked peculiarity of fertile lands—good physical condition. No matter how rich the area in the essentials of plant life, though every foot of the land be saturated with phosphates and potash and nitrates, yet, being in poor physical condition, the returns are sure to be low.

A bare definition of physical condition will indicate but imperfectly the reasons for the results claimed.

Physical condition may be said to mean the degree of friability or openness or crumbliness of a soil, its power to retain moisture, and its immediate water-content.

To show the importance attached to good physical condition by one of the most famous of agriculturists, let me quote from the works of the late Sir John Lawes, chief of the celebrated Rothamstead experiment station, who, after an experience of over 50 years in soil cultivation and fertilization, said : 'All our experiments tend to show that it is the physical condition, its capacity for absorbing and retaining water, its permeability to roots, and its capacity for absorbing and retaining heat that is of more importance than its chemical composition.'

Conditions of Plant Growth.—To discuss 'good physical conditions, it is necessary to consider for a few moments the requirements of the healthy, growing plant. They are : Light, air, moisture, heat and food. The lack of any one, or the superabundance of any one, means death to the plant. Their presence in too small or too large proportions means sickly plants.

Light, we cannot control, therefore it need not be discussed.

Air will, of course, always surround the stems and leaves of our crops, but it is just as necessary to the roots. Water-soaked, baked, or puddled soils do not permit any air to circulate among their particles. They are, therefore, not suited for plant occupation. It is to lack of air in such cases rather than superabundance of water or impermeability of the soil to roots that failure is due.

Moisture, or water is necessary as a solvent for much of the plant's food. It serves as a vehicle for carrying the food from the soil to the leaves of the plant. An abundance is absolutely indispensable, an over-supply is fatally injurious.

The heat necessary for seed germination and plant growth is a relative condition, and so dependent upon the other factors for its effectiveness as to need but little discussion at this point. That high temperatures with abundant moisture induce rank growth is well known to every farmer. To secure such a combination in our northern latitudes requires careful cultivation. It really depends on good physical condition.

Food is, of course, an important requirement in plant growth. Acting on the assumption that food is the all in all, the one great factor in plant life, many have followed this premise to its logical conclusion and supplied the plant with food in specially prepared forms in more or less homeopathic (relatively speaking) doses. Most soils contain immense quantities of plant food. It is not always in an available form. Adding to this supply in practically the same form will not guarantee good results. The following of a course likely to secure good physical conditions would insure an abundant supply of plant food in the form best suited for sustaining plant life by converting the erstwhile unavailable food into available forms.

Influences Affecting Physical Condition of Soils.

The influences affecting physical condition are various, and it cannot be hoped to discuss them at any length at the present moment. To name the more important conditions, without reference to their relative importance, they might be said to be :—

1. The character of the soil ; that is, whether a clay, a clayey loam, sandy loam, sand, gravel, muck or peaty and, generally speaking, whether of a drift or an alluvial formation.

2. The water-line or water-level of the area.

3. The condition of the soil at time of cultivation ; that is, whether wet or dry when last ploughed or cultivated.

4. The crop that has been grown the previous year.

5. The amount of humus in the soil and the character of the same.

Character of the Soil.—The character of the soil is, generally speaking, the factor most likely to affect the physical condition of a field where no special attention has been paid to improvement of this imperative condition of fertility. The more the farmer studies the influences affecting physical condition and attempts in the right way to improve the same, however, the less will he find to be the necessity for considering the kind of soil making up his fields.

In the case of well drained alluvial soils he can hardly make a miss did he try. Other soils, however, require more careful treatment, especially is this the case where the extremes, as they might be called—a heavy clay or a light sand—are to be considered. The intermediate soils demand less careful treatment and are very seldom injured by time or manner of cultivation.

The Water-line.—While once the water-level is 6 or 8 inches below the surface, it is quite possible to cultivate the fields, yet if success would be assured some way must be found to make the water-line at least 2 feet below the average soil surface level. Frequently, good crops may be grown where the water stands higher than this, but under average conditions it will be found profitable to so drain as to insure a root bed of at least twenty-four inches in depth. Roots will not penetrate below the water-line to any appreciable extent. The water-line is, therefore, the lower boundary of any farm or field. By how much lower this line, by so much more farm land for the owner may be said of it. True, the area of arable land is not changed, but the hunting ground of the root is extended, and this is, generally speaking, accompanied by a more vigorous, rank and rapid plant growth, there being, of course, so much more room for root development.

The condition of the soil at time of cultivation enters so materially into the success or failure of the whole year's operation that it is justly considered by many farmers the chief point, making for a good or bad crop. The heavy soil that shows a shining surface, glistening with moisture behind the plough, cannot be expected to give good returns from the next crop. The particles becoming compacted form into more or less large clods and all fertility contained in them is locked in the lump, not for one year merely, but for an indefinite period. The harm done by the simple operation cannot be undone save by years of patient, skilful toil.

As the gradation of soil goes towards the lighter or sandy forms less and less care need be given to its condition at time of cultivation, since there is less danger of the particles compacting.

The Previous Crop.—As a factor in the physical condition of a field at a given time, the previous crop on that field is usually of great importance. The turning down of a heavy sod makes a great difference in the physical condition of a field and in no kind of soil is the good effect more evident than heavy clay. The turning down of stubble is also beneficial, but not to the same extent.

The influence of fallow or partial fallow, as after corn, roots or potatoes, is also beneficial. The manure usually applied with such crops in addition to the cultivation puts the soil in a loose friable condition and a part of the plant food previously unavailable may after such crops be taken up by the plant.

Humus.—As an influence on the physical condition of a soil, humus is without a peer. As a factor in the improving of our soils it cannot be over-estimated. Its influence goes to render friable the heavy clay and to relieve it from the tendency to bake or harden. It has an opposite effect on light or sandy soils, the particles of which it causes to adhere and so make a firm root bed, the condition so often lacking in such soil, yet so essential to good results. The effect of humus on the water-content is to increase the amount of water possible of being held by a given volume of soil without doing injury to the plant root life therein. For this reason all dry soils are very greatly improved by humus, and for the same reason the humus should be retained

near the surface of the soil since that is the part most likely to suffer from evaporation.

In addition, while increasing the water holding power of a soil it increases the heat absorbing power and so promotes growth in that way ; heat and moisture, as stated above, making the best combination for rapid growth.

The continued cropping of our farm lands without an adequate return of farm-yard manure or the sufficient use of clover has resulted in the poor condition of many farms. The addition of humus to such so-called fertility depleted areas soon insures good crops and an apparent return of all the virgin richness.

Humus is decayed vegetable matter.—Farm-yard manure, clover roots, and green crops ploughed under are its most fruitful sources. Its place is near the surface. It can be kept there by surface cultivation.

ESTIMATING COST OF PRODUCTION.

The importance of determining cost of production of our grain and forage crops is scarcely questionable. The climatic, and soil factors must, however, always be of primary importance, and on that account all estimates must be more or less particular in their bearing rather than general.

In the estimates which are included in the following reports on the different crops, rent, manure, labour, material (seed, twine, &c.), and wear and tear are considered. The item of supervision, of considerable moment on such farms as this, has been omitted, since most farmers in Canada do much of their own work, as well as direct the labour of such men as they employ.

The digestibility of a feed is another factor which must enter materially into any consideration of its economy of production, since, as is well known, the digestibility of our feeding stuffs ranges from about 25 per cent of the dry matter to practically 100 per cent of the whole thing.

In dividing the cost of production of a grain crop between the straw and grain, however, where the digestible dry matter of the one part is so different in composition and value from that of the other, some additional standard is necessary. Since protein is that part of any ration the most expensive to supply, it was decided to make the digestible protein the basis of value. It is, of course, well understood that protein is not the only important constituent of straw. Frequently it is of very minor consideration indeed, as when used for litter, since about 29-30 of the whole dry matter is of equal or even greater value as absorbent material.

CROP ON THE 200 ACRE FARM

OATS.

Seven varieties of oats were grown ; they were Banner, Siberian, Tartar King, Waverly, Goldfinder, Scotch Potato and Improved Ligowo. They were sown on land that had been in roots or corn the preceding year. As the land was not of uniform character, the results will not indicate the comparative productivity of the different varieties.

The particulars of the lots sown are as follows :

Banner.—16 acres, sown May 4, 2 bushels per acre ; matured in 94 days, August 6. Yielded 45 bushels 2 pounds per acre. Measured bushel weighed 35 pounds.

Siberian.—8 acres, sown May 2, 1¾ bushels per acre ; matured in 91 days, August 1. Yielded 45 bushels 2 pounds per acre. Measured bushel weighed 31 pounds.

Waverly.—2 acres, sown May 1, 1¾ bushels per acre ; matured in 97 days, August 5. Yielded 47 bushels 8 pounds per acre. Measured bushels weighed 35¾ pounds.

Tartar King.—2 acres, sown May 1, 2 bushels per acre ; matured in 93 days, August 1. Yielded 47 bushels 1 pound per acre. Measured bushel weighed 36½ pounds.

Scotch Potato.—1 acre, sown May 1, 1¾ bushels per acre ; matured in 111 days, August 9. Yielded 44 bushels 19 pounds per acre. Measured bushel weighed 36 pounds.

Goldfinder.—1 acre, sown May 1, 2 bushels per acre ; matured in 111 days, August 9. Yielded 51 bushels 16 pounds per acre. Measured bushel weighed 34½ pounds.

Improved Ligowo.—5 acres, sown May 4, 1¾ bushels per acre ; matured in 88 days, July 31. Yielded 47 bushels per acre. Measured bushel weighed 37½ pounds.

Cost of growing 35 acres of oats—

Rent of land, at $3 per acre	$105 00
Cultivating and ribbing in autumn, 7½ days at $2.50	18 75
Cultivating and harrowing, 12 days at $2.50	30 00
⅓ manure, at the rate of 15 tons per acre, applied in root year, valued at $1 per ton	105 00
Seed, 66 bushels at 50 cents	33 00
Sowing, 3½ days at $2.50	8 75
Rolling, 2 days at $2.50	5 00
Cutting with binder, 3½ days at $2.50	8 75
Use of machinery	4 00
Twine	14 00
Shocking, 7 days at $1.25	8 75
Loading and unloading, 18 days at $1.25	22 50
Teams drawing, 6 days at $2.50	15 00
Threshing, 1,612 bushels at 2½ cents per bushel	40 30
	$418 80

Total yield, 54,815 pounds, or 1,612 bushels 7 pounds.

Average yield per acre, 1,566 pounds, or 46 bushels 2 pounds.

Total straw on 35 acres, 30 tons.

Cost to produce 1 bushel grain	22·7 cts.
Cost to produce 1 ton grain	$13 37
Cost to produce 1 ton straw	1 74
Cost to produce 100 pounds digestible dry matter, grain	107·3 cts.
Cost to produce 100 pounds digestible dry matter, straw	19·8 cts.

BARLEY.

Mensury.—5 acres were sown on what had been turnip land the preceding year. Sown May 4 ; matured in 79 days, July 22. Yielded 36 bushels 33 pounds per acre. Measured bushel weighed 48 pounds.

Cost of growing 5 acres of barley—

Rent of land, 5 acres at $3 per acre	$15 00
Ribbing in autumn, 1 day at $2.50	2 50
Cultivating in spring, twice, 1 4-10 days at $2.50	3 50
Harrowing, 3-10 day at $2.50	0 75
Manure, ⅓, at the rate of 15 tons per acre, at $1 per ton	15 00
Seed, 8¾ bushels at 50 cents	4 37½
Sowing, ½ day at $2.50 per day	1 25
Rolling, 3 hours at $2.50 per day	0 75
Cutting with binder, ½ day	1 25
Twine used, $2 ; use of machinery, $2	4 00
Shocking, 8-10 day at $1.25	1 00
Hauling, team 1 day, $2.50 ; men, 2 at $1.25	5 00
Threshing, 184 bushels at 3½ cents per bushel	6 44
	$60 81½

Total yield, 183 bushels, 21 pounds, or 8,784 pounds.

Average yield per acre, 36 bushels 33 pounds, or 1,757 pounds.

Total straw on 5 acres, 4 tons.

Cost to produce 1 bushel grain	33·1 cts.
Cost to produce 1 ton grain	$13 84
Cost to produce 1 ton straw	1 70
Cost to produce 100 lbs. digestible dry matter, grain	90·3 cts.
Cost to produce 100 lbs. digestible dry matter, straw	18·7 cts.

PEASE.

Blue Prussian.—5 acres. This crop was grown on land that had been pastured the previous year. It had been broken up early the preceding autumn. The seeding was done May 7, and the crop matured in 95 days, August 10. Intense heat dried this crop up before ripening, lessening the yield per acre considerably. The yield was 19 bushels per acre. Measured bushel weighed 63 pounds.

Cost of growing 5 acres of pease—

Rent of land, at $3 per acre	$15 00
⅓ manure, 15 tons to the acre, at $1 per ton	15 00
Ploughing shallow in autumn, at $1.50 per acre	7 50
Cultivating twice in autumn 1½ days	3 75
Ribbing in autumn, 1 day, $2.50	2 50
Cultivating in spring twice 1 5-10 days at $2.50	3 75
Seed, 10 bushels at 80 cents	8 00
Sowing, ½ day, team	1 25
Cutting, team 1 day at $2.50, men assisting, 2 at $1.25	5 00
Threshing, at 2½ cents per bushel, 95 bushels	2 37
	$64 12

Yield, 5,698 pounds, or 95 bushels grain.

Average yield per acre, 1,139 pounds, or 19 bushels.

Total straw on 5 acres, 4 tons 1,000 pounds.

Cost to produce 1 ton grain	$17 33
Cost to produce 1 bushel grain..	52
Cost to produce 1 ton straw..	3 27
Cost to produce 100 lbs. digestible dry matter, grain.. ..	110·7 cts.
Cost to produce 100 lbs. digestible dry matter, straw.. ..	43 cts.

MIXED CROP EXPERIMENTS.

Side by side on the first year of the rotation field, that is, on what had been pasture the preceding year, were sown 8 plots of 2 acres each, the aim being to get some data as to the comparative yields of crops grown as mixtures and as pure grains. The yields were materially affected by the bad season. The rank growth of the early part of the season made those mixtures containing pease rather more susceptible to injury from heat than were other mixtures or pure grains. The mixtures and pure grains are as follows :—

	Pounds.
Plot 1, pure pease, Blue Prussian, yielded	2,279
Plot 2, pure barley, Canadian Thorpe, yielded	2,140
Plot 3, pure oats, Banner, yielded	3,637
Plot 4, pease and oats, equal parts by measure	2,022
Plot 5, pease, 1 bushel, oats, 2 bushels, yielded	1,492
Plot 6, oats 1½ bushels, barley 1 bushel, yielded	2,477
Plot 7, wheat ½ bushel, barley ¾ bushel, oats 1 bushel, pease, ¾ bushel, yielded	1,775
Plot 8, pease and oats, equal parts by weight, yielded	2,114

HAY.

As in previous years, the hay crop follows the grain, which comes immediately after roots and corn. At the same time as the grain is sown a heavy seeding of timothy and clover is made. Clover is sown at the rate of 6 pounds red clover and 2 pounds of Alsike per acre, mixed with 12 pounds of timothy seed. Where surface cultivation is practised, and the surface soil for that reason particularly rich in humus, there is very little danger of a miss or failure.

The first cutting of hay is principally clover, the aftermath contains usually a good sprinkling of timothy, and the next crop in the succeeding spring will be chiefly timothy with a slight admixture of Alsike. Two years under hay or hay and pasture is quite sufficient, if it is intended to maintain or increase the fertility of the soil or if it is desired to get the very best returns from the land.

The importance and advisability of giving a good heavy seeding and leaving only a short time down, was well exemplified here this year. Twenty-two dairy cows were pastured on 16 acres and in July it was deemed advisable to cut the grass on the pasture, as it was evident the cattle would not be able to use it to advantage. From the 16 acres were cut 11 tons 1,355 pounds of cured hay.

BROME GRASS FOR PASTURE.

A rather noticeable area in the above 16 acres was a stretch of 4 acres in extent, which had been seeded to brome grass when the rest of the field had been seeded to clover and timothy. The growth was very thick and strong, but the cattle seemed

to prefer it to the other herbage and ate it close to the ground, leaving the timothy and clover on the adjoining land to make such a growth as is indicated above.

Hay was an excellent crop here this year, and leaves a large margin of profit.

Cost of growing clover hay—

Rent of land, at $3 on 37 acres	$111 00
⅓ manure, at the rate of 15 tons per acre at $1 per ton	111 00
½ seed, at $1.50 per acre, 10 lbs. clover, 12 lbs. timothy	46 25
5 days cutting with mower, at $2.50 per day	12 50
3½ days raking, at $1.75 per day	6 13
3½ days tedder, at $1.75 per day	6 12
Rent of farm machinery, oil, &c.	4 50
Cocking, loading, and unloading, 28 days at $1.25	35 00
7 days drawing to barn, at $2.50	17 50
	$350 00

Yield, 3 tons 484 pounds per acre

Total yield, 119 tons 1,908 pounds.

Average amount digestible dry matter in 1 ton, 1,100 pounds.

Cost to produce 1 ton of hay in barn	$ 2 92
Cost to produce 100 lbs. digestible dry matter	26·54
Cost to produce 1 acre of hay	9 48
Cost to produce 1 ton digestible dry matter, labour alone considered	1 17

The second crop on 20 acres of the above was very heavy. It was chiefly clover, but included a small admixture of timothy. It made very cheap hay, as indicated below. The yield was 1 ton 95 lbs. per acre.

Clover, second crop, season of 1901—

20 acres reported above gave a yield of 1 ton and 95 pounds.

Cutting with mower, 2½ days at $2.50	$ 6 25
Raking, 2 days at $1.75 per day	3 50
Cocking, loading and unloading, 10 men at $1.25	12 50
Drawing, teams, 2 at $2.50	5 00
Rent of farm machinery	2 50
	$29 75

Total yield, 20 tons 1,900 pounds.

Cost to produce 1 ton hay in barn	$ 1 42

CLOVER ENSILAGE.

As noted in report for 1900, a small silo was built that year for experimental purposes. This silo was filled for the first time, with second growth or aftermath, principally clover. The grass and clover was mown August 31, 1900, early in the morning and hauled to the silo while still wet with dew. It was thrown into the silo uncut and tramped as firm as possible. The mass of green forage cured into excellent ensilage and was eagerly eaten by the cattle, but was not relished by sheep. There was considerable waste on top and around the sides (probably 10 per cent of the whole amount that it was found possible to place in the silo).

The silo is a round one, built of staves on the plan outlined in Bulletin No. 35. It is 9 feet in diameter by 22 feet in height. Such a silo should hold, when well filled, about 30 tons of corn ensilage. By most careful filling on 3 separate dates we were able to include only 16 tons of the wet forage.

The material as put into the silo contained about 470 lbs. dry matter per ton. Such dry matter is about 70 per cent digestible. Since at least 10 per cent was wasted, there remained only 14·4 tons material. This amount of ensilage would contain 4,318 lbs. digestible dry matter.

The forage came off 3 acres. Below is a statement of the cost of the material in the silo. Naturally, only half the annual rental and manure expenditure are included.

Cost of 3 acres clover aftermath in silo—

Rent of land, half amount, 3 acres	$ 4 50
Manure, $\frac{1}{3}$ at 15 tons per acre, $1 per ton, half amount . .	4 50
Seed, $\frac{1}{4}$ at $1.50	37$\frac{1}{2}$
Mowing, 4 hours at 25 cents per hour	1 00
Raking, 3 hours at 17$\frac{1}{2}$ cents	52$\frac{1}{2}$
Drawing, 1$\frac{1}{2}$ days at $2.50 per day	3 75
Men, loading and unloading, 6 at $1.25 per day	7 50
	$22 15

Total forage cured, 14$\frac{2}{5}$ tons.

Total amount digestible dry matter, 4,318 lbs.

Cost to produce 1 ton ensilage in silo	$ 1 54
Cost to produce 100 lbs. digestible dry matter	51·3

On June 6, 1901, this silo was filled again with practically pure clover. This time, however, the forage was cut into inch lengths. Owing to the material being cut into short lengths, we were able to include 33 tons 660 lbs. in the silo. This, it will be observed, is double the amount included when the forage was put in as mown.

The cut forage cured with very little waste into excellent ensilage, which was eaten with eagerness by dairy cattle as supplementary feed to pasture in August and September. To give some idea of the cost of producing such feed, when first cutting of clover is used rather than the last cutting, the subjoined itemized statement is included. The area from which the clover was removed, served later as a pasture for pigs and sheep ; therefore, only half the cost of rent and manure are charged.

Cost of growing clover ensilage (4 acres)—

Rent of land, half amount, 4 acres	$ 6 00
Manure, $\frac{1}{5}$ at 15 tons per acre (half amount)	6 00
Seed, $\frac{1}{4}$ at $1.50 per acre	37$\frac{1}{2}$
Mowing, 5 hours at 25 cents per hour	1 25
Raking, $\frac{1}{2}$ day at $1.75 per day	87$\frac{1}{2}$
Drawing, 2 days at $2.50	5 00
Men loading, working at blower and in silo, 10 at $1.25 per day	12 50
	$32 00

Forage produced, 33 tons 660 pounds.

Average dry matter per ton, about 360 lbs. (70 per cent digestible.)

Cost to produce 1 ton ensilage in silo.	96·2 cts.
Cost to produce 100 lbs. digestible dry matter.	38·2 cts.

CORN (ZEA MAYS).

Four varieties of corn were sown in areas ranging from 2 to 20 acres, the aggregate being 30 acres.

They were sown on land that had been under various grain crops the preceding year, and clover had been sown with all, excepting the pure pease. The soil was gang ploughed in late autumn, a good growth of clover being turned down. Manure at the rate of about 15 tons to the acre was hauled out in the winter, left in small heaps and scattered as the frost was leaving the ground. The soil was ploughed about 4 inches deep, harrowed, and then sown with a force seed drill in rows 42 inches apart. It was impossible to get all the corn into the silos. Particulars of the varieties are as follows :—

Leaming.—20 acres, sown May 27, cut for ensilage September 18 to 26. Yield, 16 tons 1,286 pounds per acre. Growth very strong and even, well cobbed, beginning to ripen. This plot suffered by very severe frost, lessening weight per acre.

Mammoth Cuban.—3½ acres, sown May 27, cut for ensilage September 27. Yield, 17 tons 90 pounds per acre. Growth very strong and even, well cobbed, beginning to ripen. This plot suffered by severe frost.

Mammoth Cuban.—1½ acres, sown May 27, cut and shocked September 28.

Longfellow.—2 acres, sown May 30, cut and shocked September 28. Strong, even growth, corn ripe, well cobbed.

King of the Earliest.—2 acres, sown May 30, cut and shocked September 30. Strong, even growth, cobs short, not as good as any of the other sorts.

Cost of growing 20 acres of Leaming—

Rent of land, at $3 per acre	$ 60 00
Gang ploughed in autumn, 6 8-10 days at $2.50	17 00
½ value of manure at 15 tons per acre at $1 per ton	60 00
Ploughing in spring, at $2 per acre	40 00
Harrowing twice, 2 4-10 days, at $2.50 per day	6 00
Seed, 35 lbs. per acre, 500 lbs. at $1 per cwt.	5 00
Sowing, team, 2½ days at $2.50 per day	6 25
Harrowing after sowing, twice, 2 4-10 days at $2.50 per day	6 00
Hoeing, 46 days at $1.25 per day	56 50
Cultivating, 15 days at $2.50 per day	37 50
Cutting with corn harvester, 6 days at $2.50	15 00
Loading, unloading, tramping and putting into silo, 69 days at $1.25	86 25
Drawing with team, 18½ days at $2.50	46 25
Use of engine, fuel, ensilage cutter and engineer for 5 days at $6.50	32 50
	$474 25

Yielded 332 tons 1,720 pounds corn.

Cost 1 ton in silo	$ 1 42⅓
Cost 1 bushel in silo	04.27 cts.
Average amount digestible dry matter per ton (75 per cent digestible)	370 lbs.
Cost to produce 100 lbs. digestible dry matter	38·47 cts.
Cost to produce 1 acre corn	$23 71

MANGELS.

Three varieties of mangels were grown on 6 acres of land. The seed was sown May 14, and harvesting operations began October 18. The varieties were as follows :

Gate Post Red.—2 acres, yielded 20 tons 5 lbs. per acre, or 40 tons 10 lbs., equal to 1,333½ bushels on the 2 acres.

Giant Yellow Globe.—2 acres, yielded 19 tons 1,040 lbs. per acre, or 39 tons 80 lbs., equal to 1,318 bushels on the 2 acres.

Golden Tankard.—2 acres, yielded 22 tons 1,030 lbs. per acre, or 45 tons 60 lbs., equal to 1,501 bushels on the 2 acres.

The dry matter content of the varieties differs slightly. They are as follows :—

Variety.	Digestible Dry Matter in 100 lbs. Roots.	From 1 Acre, lbs. of Digestible Dry Matter.
Gate Post Red	9·29	3,716·46
Giant Yellow Globe	9·10	3,552·64
Golden Tankard	9·63	4,336·39

Cost of growing 6 acres mangels—

Rent of land, at $3	$18 00
Gang ploughing in autumn, 2 4-10 days at $2.50	6 00
½ cost of manuring at 15 tons per acre, at $1 per ton	18 00
Ploughing in spring at $2 per acre	12 00
Harrowing, 4 hours at 25 cents	1 00
Drilling, 2½ days at $2.50 per day	6 25
Rolling, 4 hours at 25 cents	1 00
Seed, 24 lbs. at 20 cents	4 80
Sowing, 2 4-10 days at $1.25	3 00
Thinning, 12 days at $1.25 per day	15 00
Hand-wheel hoeing, 7 days at $1.25	8 75
Hoeing, 14 days at $1.25	17 50
Cultivating, single horse, 8 days at $1.75 per day	14 00
Pulling, topping, loading and unloading, 24 days at $1.25	30 00
Drawing team, 6 days at $2.50 per day	15 00
	$170 30

Total yield, 123 tons 1,560 lbs., average, 20 tons 1,260 lbs., or 687⅗ bushels per acre.

Cost to produce 1 ton mangels housed	$ 1 37½
Cost to produce 1 bushel mangels housed	4·12
Average dry matter per ton	187·5 lbs.
Cost to produce 100 lbs. digestible dry matter	73·3
Cost to produce 1 acre mangels	$28 38

TURNIPS.

Two varieties were grown, sown June 8, harvested November 4 ; manure was applied during the winter and spring at the rate of about 15 tons per acre.

Champion Purple Top Swede.—1 acre, yielded 18 tons 520 lbs., or 608⅔ bushels per acre.

Prize Purple Top Swede.—1 acre, yielded 17 tons 1,450 lbs., or 590⅚ bushels per acre.

Cost—

Rent of land, at $3 per acre	$ 6 00
Gang ploughing, 8-10 days at $2.50	2 00
⅓ manure, 15 tons per acre, valued at $1 per acre	6 00
Ploughing in spring, at $2 per acre	4 00
Harrowing, 2-10 days at 25 cents per hour.	0 50
Drilling, 8-10 days at 25 cents per hour	2 00
Rolling, 1 hour at 25 cents	0 25
Seed, 6 lbs. at 20 cents	1 20
Sowing, 8 hours at $1.25 per day	1 00
Hand-wheel hoeing, 1 6-10 days at $1.25	2 00
Thinning, 4 days at $1.25	5 00
Hoeing, once, 2½ days at $1.25	3 13
Cultivating, single horse, 2 days, at $1.75 per day	3 50
Pulling, topping, loading and unloading, 9 men at $1.25 . .	11 25
Drawing, 2 days at $2.50	5 00
	$52 83

Total yield from 2 acres, 35 tons 1,970 lbs.

Cost to produce 1 ton turnips housed	$ 1 47
Cost to produce 1 bushel turnips housed	4·41
Average digestible dry matter in 1 ton	209·8 lbs.
Cost to produce 100 lbs. digestible dry matter.	$ 0 70
Cost to produce 1 acre of turnips	26 42

HARVESTING TURNIPS.

Much is heard as to the best methods of harvesting turnips, and in order to get some definite information as to the comparative economy of some of the more common plans, a record was kept of the time occupied in harvesting each of 3 equal plots.

Plot 1.—Size, ¾ of an acre. The manual labour required to harvest this plot was equal to 1 man for 24 hours. The turnips were pulled by hand, and the roots and tops removed by a large knife in the hands of the operator.

Plot 2.—Size, ¾ of an acre. The manual labour required to harvest this plot was equal to 1 man for 26 hours 40 minutes. The turnips were topped by means of hoes while still firm in the earth. They were then bottomed, or the roots removed, with the same implements. The topping and bottoming took much less time when done this way than when each turnip passed through the hands of the operator, but much more time was required to load the turnips.

Plot 3.—Size, ¾ of an acre. The manual labour required to harvest this plot was equal to 1 man for 24 hours 5 minutes, besides horse labour of 1 horse for 5 hours. The turnips were topped by means of hoes while still firm in the earth. They were then bottomed, or the roots removed, by means of a single horse cultivator with

all but the 'L' teeth removed. These were set so close as to necessitate the cutting of everything that passed between the standards. As in plot 2, much more time was required to load roots topped and bottomed this way than when handled as in plot 1.

CARROTS.

On account of trouble in keping red carrots in good condition for any length of time, it was decided to abandon for a while the use of this root as a field crop. The method of growing the white carrots was quite similar to that described in previous reports and the variety grown was the Improved Short White. The seed was sown May 15. The carrots made a good rapid growth and were harvested October 21. The yield was 26 tons 1,080 lbs., or 884⅔ bushels from 1 acre.

Cost of growing one acre—

Rent of land	$ 3 00
Gang ploughing in autumn, 4-10 days at $2.50..	1 00
⅕ manure, 15 tons per acre, $1 per ton	3 00
Ploughing in spring, ⅘ days at $2.50	2 00
Harrowing, 1½ hours at 25 cents	37½
Drilling, 3½ hours at 25 cents	87½
Rolling, ¾ hour at 25 cents	18¾
Seed, 3 lbs. at 45 cents	1 35
Sowing, 4 hours at 12½ cents per hour	0 50
Hand-wheel hoeing, twice, 1½ days at $1.25	1 87½
Thinning, 3½ days at $1.25 per day	4 37½
Hoeing once, 1¼ days at $1.25 per day	1 56¼
Cultivating, single horse, 1 3-10 days at $1.75 per day	2 27½
Ploughing out carrots, team, 3½ hours, at $2.50 per day ..	0 87½
Pulling, topping, loading and unloading, 8 days at $1.25 ..	10 00
Drawing, 1½ day at $2.50	3 75
	$37 00

Grown on one acre, 26 tons 1,080 lbs.

Cost to grow 1 ton carrots housed	$ 1 39
Cost to grow 1 bushel carrots housed	4·18
Average dry matter per ton	200 lbs.
Cost of 100 lbs. digestible dry matter	69½ cts.

SUGAR BEETS.

Two plots of sugar beets were grown, Danish Improved was the variety selected.

To gain some information as to the comparative economy of growing sugar beets or mangels for feed, and to ascertain the relative cost of growing a given area (1) as for forage, (2) as for sugar, two plots of one-half acre each were grown side by side. The ground was prepared as for other root crops, and the same amount of barn-yard manure was applied. In thinning for forage, plants were left 8 inches apart ; but for sugar, 6 inches apart. The hoeing, cultivating, &c., was the same for some time, but when a fair growth had been made, that is, when the plants were about two months old, those intended for forage were treated as mangels, *i.e.*, the upper part of the root left exposed, while those intended for sugar were hilled up, the whole root and crown thereof being covered.

Yield per acre was at the rate of 17 tons 840 lbs. from the forage, and 16 tons 600 lbs. from the sugar plot, or 560⅔ bushels and 543⅓ bushels, respectively

The digestible dry matter content of the roots from the two plots differed materially, namely, 19.50 lbs. of dry matter in 100 lbs. of roots in the case of roots cultivated for sugar, and 18·54 lbs. of dry matter in 100 lbs. of roots intended for forage. Below is the cost of producing sugar beets, (*a*) for sugar, (*b*) for forage :—

(*a*) *Beets* (*for Sugar*).

Cost of growing one-half acre sugar beets, for sugar—

Rent of land, at $3 per acre	$ 1 50
Gang ploughing in autumn, 2 hours at 25 cents	0 50
½ manure, at 15 tons per acre, valued at $1 per ton	1 50
Ploughing in spring, at $2 per acre	1 00
Harrowing in spring	0 20
Drilling in spring	0 37½
Rolling in spring	0 08
Seed, 6 lbs. at 20 cents per lb.	1 20
Sowing, 2 hours, at $1.25 per day	0 25
Hand-wheel hoeing, 3 hours at $1.25 per day	0 37½
Thinning, 2 2-10 at $1.25 per day	2 75
Hoeing twice, 12 hours	1 50
Cultivating, single horse, 4 times at $1.75 per day, two hours each	1 40
Ploughing out roots, 2 hours at 25 cents	0 50
Pulling and topping, 2 days at $1.25 per day	2 50
Drawing in roots, 6½ hours at $2.50 per day	1 62½
Loading and unloading, 17 hours at 12½ cents	2 12
	$19 37½

Yield on one-half acre, 16,300 lbs.

Cost to produce 1 ton	$ 2 38
Cost to produce 1 bushel	7:14
Digestible dry matter in 1 ton	390 lbs.
Cost of 100 lbs. digestible dry matter	61 cts.
Cost to grow 1 acre sugar beets	$38 75

(*b*) *Sugar Beet* (*for Feed*).

Cost of growing one-half acre sugar beets, for feed—

Rent of land, at $3	$ 1 50
Gang ploughing in autumn, 2 hours at 25 cents	0 50
½ manured at 15 tons per acre, valued at $1 per ton	1 50
Ploughing in spring at $2 per acre	1 00
Harrowing in spring	0 20
Drilling in spring	0 37½
Rolling in spring	0 08
Seed, 6 lbs. at 20 cents per lb.	1 20
Sowing, 2 hours, at $1.25 per day	0 25
Hand-wheel hoeing, 3 hours at $1.25 per day	0 37½
Thinning, 1 8-10 days at $1.25 per day	2 25
Hoeing, one day at $1.25	1 25
Cultivating, single horse, 4 times, 2 hours each, at $1.75	1 40
Ploughing out roots, 2 hours at 25 cents	0 50
Pulling and topping, 18 hours at $1.25 per day	2 25
Drawing in roots, 6 hours at $2.50 per day	1 50
Loading and unloading, 14 hours at $1.25 per day	1 75

Yield on one-half acre, 17,420 lbs. **$17 88**

Cost to produce 1 ton	$ 2 05
Cost to produce 1 bushel	6·15
Digestible dry matter in 1 ton	371 lbs.
Cost of 100 lbs. digestible dry matter	55 cts.
Cost to grow 1 acre for forage	$35 76

RAPE.

This forage plant has come rather slowly to the front in Ontario, and is practically unknown in the other provinces of the Dominion. As the production of pork, mutton and beef increases, however, it is certain to come more into common use. As a feed for young stock of any description it is unequalled. As a supplementary ration for pigs and lambs it is unrivalled. As a partial ration for 'feeders' when first stabled in autumn it is unexcelled.

The greatest returns from a given area are secured by using as a soiling crop. Excellent results are obtained by pasturing. When sown early and cut for feed it will grow up again. When pastured off not too closely, a growth of nourishing succulent forage is constantly available.

It may be grown with a cover crop or independently. When sown with barley or oats, good results may frequently be anticipated. Under such conditions, however, it is very much more influenced by the vagaries of the weather. When sown alone it may be put in broadcast or in rows. When the soil is strong and the season somewhat advanced, it is occasionally advisable to sow broadcast. Generally speaking, it should be sown in rows from 21 to 30 inches apart. Where the rows are close together, a somewhat greater portion of the plant goes to stalk rather than leaves which are the most nutritious. In rows 30 inches apart there is ample room for full leaf development ; besides, it is much easier to cultivate and keep in a vigorous growing condition.

Rape is a greedy feeder and will do well on the richest land. We have never seen land too strong for it. It is not particular as to the kind of soil in which it shall grow, but is imperative in its demands for large supplies of food. A soil rich in humus is much to its liking.

The plant is quite as rich in protein or flesh forming material as are the legumes. It adds nothing to the soil, however, but is on the contrary rather exhaustive. Where fed off on the field it improves the condition of the land. Rape may not be cured for winter use. If cut late in the autumn, however, and left in small piles to freeze, it may be brought in later, and after being perfectly thawed out may be fed to steers or other cattle.

The preparation of the soil is important. A well rotted sod should be chosen. It should be thoroughly cultivated to a fair depth, say, 6 inches. The seed should then be sown on the flat, unless in very wet soil, when it is preferable to ridge. The seed is sown at about the same rate per acre as turnip seed. The land must be cultivated between the rows for some weeks. The plants should not be thinned in the rows. Under fair conditions the crop may be pastured about the eighth week. It may be cut for soiling about the tenth week.

The seeds of several varieties are on the market. A test of some of these was made this year. Three varieties were sown under similar conditions on similar soil at the rate of three pounds per acre. The results were as follows :—

Plot 1.—¼ acre, sown May 20, in drills 30 inches apart.

Lot 1. *Dwarf Victoria.*—Growth weak, drying out, not desirable.

Lot 2. *Dwarf Essex.*—Growth strong, best of first set.

Lot 3. *Broad Leaved.*—Growth fairly strong, not as broad leaved as Lot 2.

The plot appeared to have been sown too early or should have been fed earlier.

Plot 2.—¼ acre, sown June 1 in drills 30 inches apart.

Lot 1. *Dwarf Victoria.*—Growth fairly strong, better than Plot 1, Lot 1.

Lot 2. *Dwarf Essex.*—Growth strong, even, good colour.

Lot 3. *Broad Leaved.*—Growth medium, not equal to Lot 2.

Plot 3.—¼ acre, sown June 15, in drills 30 inches apart.

Lot 1. *Dwarf Victoria.*—Growth fairly strong, about the same as Lot 2.

Lot 2. *Dwarf Essex.*—Growth about equal to Lot 1, not quite as many wilted leaves.

Lot 3. *Broad Leaved.*—Growth medium, even, not equal to Dwarf Essex.

Plot 4.—¼ acre, sown July 15, in drills 30 inches apart.

Lot 1. *Dwarf Victoria.*—Growth fairly strong, best lot of sort.

Lot 2. *Dwarf Essex.*—Growth strong, even, good colour, best lot in the plot.

Lot 3. *Broad Leaved.*—Growth medium, not equal to Dwarf Essex.

Of the three verieties sown, Dwarf Victoria, Dwarf Essex and Broad Leaved, the Dwarf Essex is apparently the best suited for this section of the country. Under no condition tested was any variety superior to the Dwarf Essex, while in some cases the Dwarf Essex was much superior to the other two sorts. The Dwarf Victoria and Broad Leaved sorts seem to be nearly equal in value for forage, with possibly a slight advantage in favour of the Broad Leaved.

To give some idea of the cost of production, the following statement has been compiled. As most of the rape this year was fed off as pasture the cost of producing a ton of this forage can not be stated.

Cost of growing two acres of rape—

Rent of land, at $3	$ 6 00
Ploughing in autumn, at $2 per acre	4 00
Cultivating twice in spring, 7 hours at 25 cents	1 75
Harrowing, twice, 3 hours at 25 cents	0 75
Rolling, 1¼ hour	0 31
Seed, 6 pounds at 10 cents	0 60
Sowing, 4 hours at $1.25 per day	0 50
Hand-wheel hoeing, once, 8 hours at $1.25	1 00
Cultivating, 3 times, single horse, 1½ days at $1.75 per day	2 62
Hoeing twice, 4 days at $1.25 per day	5 00
	$22 53

The yield per acre ranges from 6 to 30 tons of green feed. The field of rape, the cost of growing, which appears above, was part of an old pasture. It received no manure, but gave a fair stand of forage, probably 15 tons per acre. A similar field heavily manured in 1900 gave over 30 tons per acre.

PUMPKINS.

Half an acre was planted on June 8. The soil was a sandy loam, and well drained. Manure was first applied at the usual rate of 15 tons per acre, worked into the soil. The plot was then thoroughly cultivated and harrowed. It was marked off into 8-foot squares, and a small hole, about 18 inches square and 6 inches deep, excavated at each corner. These holes were half filled with manure, a layer of earth

thrown on top and seed planted. The plants grew well and in a short time covered the whole area. A large quantity of fruit developed and grew to a fair size, the yield from the half acre being 22,470 pounds, or 1,558 pumpkins, averaging 14 1-7 pounds in weight.

These were fed to dairy cattle and swine. The dairy cattle did well on this feed, and it was found difficult to maintain an equal flow of milk after the supply was exhausted.

Swine also did well on them. Dry brood sows were in some cases fed no other food, and maintained their weight.

Cost of production of pumpkins—

Rent, half an acre at $3 per acre	$ 1 50
Gang ploughing in autumn, 2 hours at 25 cents	0 50
Manure, one-fifth applied at rate of 15 tons per acre	1 50
Extra manure in hills, 6 tons, used ½ the value	3 00
Ploughing in spring	1 00
Harrowing twice	0 18
Marking, making hills, and planting 1½ days at $1.25	1 87½
Hoeing, 1 day at $1.25	1 25
Cultivating, single horse, 3 hours, at $1.75 per day	0 52
Hauling, team, 1 day, $2.50, extra man, $1.25	3 75
	$15 07½
Weight produced, 22,470 pounds.	
Cost to produce 1 ton	$ 1 34
One ton contains about 190 lbs. digestible dry matter.	
Cost of producing 100 lbs. digestible dry matter	0 70

REPORT OF THE POULTRY MANAGER.

(A. G. GILBERT.)

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the pleasure of transmitting herewith the fourteenth annual report of the poultry department. The subjects treated are in connection with the experimental work of the year, and are given under their different headings. The most important are as follows:—

1. Results of continued investigation and observation into the cause of so many weak germs in eggs laid by hens in early spring time, before they have had a run outside.

2. What experience has shown to be the best methods for farmers to adopt in the early raising of chickens.

3. The experiences of correspondents in their attempts at early hatching.

4. The want of a simple and inexpensive means of detecting the winter-laying hens from the non-productive ones. Where the present means of doing so are faulty.

5. Foods, their composition and effect. The farm rations and how made up. The rations fed by two farmers.

6. The proper care and feeding of the chickens. Their weight development.

7. New breeds on trial and their characteristics.

8. How the early moulting of the laying stock was brought about. And other detailed information in connection with the experimental work since last report.

Addresses were delivered during the year in different parts of the Dominion on the 'proper breeds of poultry for farmers' and 'the care, feeding and management of fowls so as to make them profitable.' At the Whitby and Renfrew fairs object lessons in the proper methods of killing, plucking and dressing poultry and the management of incubators and brooders were instructive and interesting features. Dressed poultry, consisting of turkeys, geese and chickens were exhibited at the Provincial Fat Stock Show at Guelph, and at the Maritime Winter Fair at Amherst, N.S., and were instructive as showing the farmers how poultry should be prepared for sale for the home markets.

I have pleasure in again mentioning the faithful services of Mr. George Deavey, who assists in the care and feeding of the poultry, &c.

The demand for reports and instruction as to poultry keeping and the breeds best suited for winter layers and rapid flesh makers from all parts of the country, has increased to a remarkable extent, and with an increased correspondence are instances of the rapid development that the poultry department of the farm is making.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT.

CENTRAL EXPERIMENTAL FARM,
OTTAWA, November 30, 1901.

REPORT OF THE WORK OF THE PAST YEAR, 1901.

The experiments and observation in connection with the procuring of eggs in winter to be sold for eating purposes, or their conversion by means of artificial incubation into chickens, technically known as broilers, were continued last season. Much attention has, in recent years, been directed to the latter part of the work. In the report of my department for 1900 (last year), results were given of the attempts made during the previous winter season to ascertain the cause or causes of the weak germs in so many of the fertilized eggs laid by hens and pullets during that period, and which resulted in a large percentage of the embryos dying, in the course of incubation, notably at the 'pipping' stage. This large percentage of loss is a serious drawback to the successful prosecution of an enterprise that offers a large margin of profit. It was shown by last season's operations that it was easier to get the fertilized egg than the strong germ so necessary for the hatching of the robust chicken. This is an important point to remember, and in reference to it a leading poultry paper remarks: 'Is a distinction that is hardly ever given any thought. If the eggs are fertile that is as far as we have gone.' The results as given in report of last year attracted widespread attention, and the hope was expressed that investigation would be continued until a satisfactory solution of the difficulties is discovered, if such be possible.

WHAT PAST EXPERIENCE HAS MADE EVIDENT.

The experience so far gained in connection with this important work shows that there is room for much study and experiment. The close observer cannot fail to realize how many are the factors to be considered, how finely adjusted must the balance be, in the treatment of his stock, so as to have them profitably productive during the winter months, when it is so much against their natural instinct to be so. In fact so great have the drawbacks in connection with the artificial hatching and rearing of chickens, during that season been found by many persons, that they unhesitatingly state their belief that more money is to be made out of the sale of winter eggs at the city prices of 35 and 40 cents per dozen than by their conversion into broilers, worth later on $1.25 to $1.50 per pair. However open this statement may be to challenge there can be no denial of the ever increasing demand for both winter eggs and early broilers. The high price offered for the latter is doubtless the incentive to their production. The numerous letters received from farmers and ambitious beginners asking for information on the subject is proof of this. In such cases the advice given in report of last year still holds good. It is to the effect that with the facilities usually at his command the farmer or beginner should be content with the production of winter eggs and late April or May chickens rather than to attempt the raising of broilers which requires expert knowledge and a special plant. The large poultry purchasing companies established in different parts of the provinces in recent years, and which are the outcome of the rapid development of the poultry interests of the country, call loudly for a well grown, plump July or August roaster. This demand should easily be filled by farmers who have the rapid flesh-making Plymouth Rocks, Wyandottes or Buff Orpingtons. That it affords a profitable margin of profit is beyond question. Doubtless there are farmers who are engaged in broiler raising, but their number is few and they are possessed of all the requisites to success in knowledge, facilities and near-by city market. The situation from the farmers standpoint is well described in the following note from the wife of a widely known farmer :—

'ENGLESIDE FARM,
'BROCKVILLE, Oct. 22, 1901.

'The Manager
'Poultry Department, Experimental Farm,
'Ottawa.

'DEAR SIR,—In reply to your question as to which pays best, from a farmer's standpoint, sale of new laid eggs in winter at 35 to 40 cents per dozen, or their con-

version into broilers to sell at $1.25 to $1.50 per pair. I think it best to sell the eggs at city prices. Unless a farmer had all the necessary plant and number of hens he could not make broiler raising pay.

'MRS. W. J. N.'

SOME OBSERVATIONS CONFIRMED.

The observations of last winter were confirmatory of those of the previous season. If they pointed to one of the suspected causes more strongly than another it was to the effect of the extremely artificial conditions under which the laying stock existed. It again seemed evident that until the hens had a run outside, and so had opportunity to recuperate from this long term of artificial life that a satisfactory percentage of strong germs could not be had. And the term of artificial life last season was unusually long, the hens going into winter quarters in mid-November and so remaining until the disappearance of the snow in the following spring. A secondary course, perhaps, may be traced to the composition of the rations, quantity and frequency with which they were fed. The composition and manner of feeding the rations is shown in another page.

It was remarked in report of last year that variety in the composition of and method of feeding the rations was beneficial, at all times, but indispensable in the month of March, if egg eating and feather picking were to be avoided. The observations of last spring emphasized this in no uncertain manner. This experience coming after an unusually long term of winter confinement makes it all the more striking.

Indeed, the observations of many years go to show that a regular supply of pure water, green food, grit, &c., are imperative, where success is the object.

THE WORK OF LAST WINTER AND RESULTS.

The work of last winter may briefly be described as follows:—Soon after going into winter quarters the hens were mated up, when possible, with two-year old male birds. At the end of December the eggs were saved for hatching. At that time the hens had been laying fairly well for a month. On the 6th of January an hundred egg incubator was filled, and throughout the winter months more eggs were placed in other incubators, which were as carefully attended to as circumstances would permit. The conditions under which the incubators were operated were perhaps a little harder, owing to the more severe and protracted season, but results were little different from those of the previous year and were most discouraging.

December and January eggs showed on examination a much larger percentage of dead germs in different stages of development than unfertile or clear eggs. Numerous fully developed chicks dead in shell, many at pipping stage. In some cases they were nearly 50 per cent of the tested eggs. This clearly pointed to weak germs. Some idea of the unsatisfactory results may be had from the following instance. On the 5th of February 180 eggs laid during the previous month of January by Plymouth Rock, Wyandotte, Langshan, Indian Game and White, Buff and Brown Leghorn hens were placed in an incubator. These eggs were hatched on the 26th of February, and resulted in 26 chickens. Six of the number were cripples and were killed. In this case after deducting 30 per cent of clear eggs and three full grown chicks which died in coming out of the shell, the memorandum made at the time reads: 'That all the remaining eggs contained dead germs in different stages of development. The hens were apparently in the best of condition and the eggs from them were large and full.' It may be noted that a Brown Leghorn pullet, one of the 26 hatched on February 26, laid her first egg on the 17th of July following, 4 months and 17 days after coming from the shell. Five days later two White Plymouth Rock pullets, and a cross pullet of the same group, laid their first eggs. Whether it is advisable to have such early laying pullets or not is shown on a following page.

MARCH AND APRIL EGGS.

The eggs of early March did not show much improvement. At end of the month the layers had opportunity to enjoy a run out, although to a limited extent. The effect on the vitality of the germ seemed beneficial, as is shown in the following results:—

On March 26, 13 White Plymouth Rock eggs were put under a broody Dorking hen. Result, 6 chickens ; 3 clear or unfertile eggs ; 1 addled egg, or one in which germ had started and then died ; 3 fully developed chicks dead at pipping stage.

On the day following, 27th instant, 13 White Wyandotte eggs were placed under a White Indian Game hen, and 13 B. P. R. eggs under a pullet of the same breed. The result in the first case was 9 chickens; 1 clear egg; 1 egg broken in nest by hen; 2 chicks dead at pipping stage. In the second, 8 chickens were hatched; 2 chicks dead in shell; 2 addled eggs. April eggs gave equally good results.

AN ASSUMPTION AND A WANT IN CONNECTION THEREWITH.

At the advent of spring the egg yield increased, and it was reasonable to assume that the hens which had not been laying in previous winter months were doing so then; also that the germs contained in their eggs were much stronger than in the eggs of the mid-winter layers. Was this actually the case?

A want that made itself felt in this connection was a means of detecting the non-productive hens from those which were regular layers. Close observation has led to the conclusion that only a small percentage of the fowls, noticeably so in the case of certain breeds, lay as frequently as is desired during the winter. On the arrival of spring a number of hens of the sitting varieties become broody, some earlier than others, and they are given eggs to hatch out. Yet the egg yield notably increases. The hens which have become broody are likely those which have been among the steady winter layers. If so their places have been undoubtedly taken by others. It is important to find out the tardy layers. Of course, no reference is made to the late hatched pullets of the previous year and which would not likely become productive until maturity at this season. A partial response to this exigency has been made in the shape of trap nests, of more or less merit, which in recent years have been placed on the market. In our department trial has been made of several patterns. Their use has led to the conclusion that they are certainly effective and valuable in the case of small flocks, but where there are many hundreds of hens, and labour saving is an object, they are likely to be a source of expense. And in this way: In the earlier half of the day the hens usually lay. During that period it would require, in a large establishment, so much attention on the part of one man to register the number of each layer, release her from and reset the trap as to fully occupy his time. To be reliable the work must carefully be attended to. It may be said that the value of discovering the non-productive hens, particularly during the season of high prices cannot be overestimated. Especially is this so in the case of the skilled breeder (as already mentioned) with his limited number of breeding pens of high class birds and who receives an unsually high price for his eggs which he sells for hatching exhibition birds. There is no intention to question the value of the trap nest to him. What is desirable is the extension of the trap nest principle, so that the proprietors or managers of the large establishments, who sell eggs for eating purposes, or for conversion into early broilers, may be enabled with little cost, certainty and despatch to detect the prolific layers from the non-productive ones.

DIFFICULTIES IN EARLY HATCHING FELT BY MANY PERSONS.

That the difficulties, as related in report of 1900 (last year), in connection with the early hatching of chickens were experienced by many others, was shown by the number of letters received during the early part of last summer on the subject. The

majority of the letters came from correspondents living in parts of the country where winter conditions are similar to ours, and told of early attempts at hatching and subsequent discouraging results. Many correspondents ended their letters with the statement: 'that this has been the worst year for early chickens ever known in this part of the country. It seemed almost impossible to have fertile eggs.' And again, 'the number of full grown chicks which were dead in the shell at hatching time was astonishing. They seemed unable to free themselves from the shell. Do you think my incubator is a good one?' An explanation of the cause and a remedy were generally asked for. In response a copy of report of last year, dealing in a preliminary way with the same difficulties, was at once forwarded. As to the results from the incubator the opinion was expressed that the probable fault was in the condition of the breeding stock rather than the machine. The statement 'that the experience was the worst ever known in that district' may be explained by the probability that efforts were made by more people, in the districts heard from, to have early chickens than ever before. The general demand in recent years for information as to the most reliable and easily operated incubators and brooders, and the expressed intention of purchasing them may fairly be taken as an indication that a large number are now in use, and the disappointing results, in connection therewith, may have called attention to obstacles to success which previously existed, but which were not so widely experienced. It is to be hoped that the attention which is now being directed by so many to the subject, apart from our experimental work, may lead to a solution of some, if not all, of the obstacles which at present seem to bar the way to unqualified success.

With this object in view it is requested of those who engage in the early hatching of chickens, and who meet with the difficulties outlined, to send to our department a description of the obstacles encountered and the suspected cause or causes.

THE FOOD AND ITS EFFECT.

It has been stated that past observations lead to the conclusion that next to the long term of artificial life in comparatively limited quarters, the food and its composition and frequency with which it is fed, has the greatest effect on the health of laying stock and vitality of germ. That such is recognized as an important influence is shown by the frequency with which the influence of the 'mash,' as a part of the daily ration, for good or bad, is discussed by leading breeders. On one hand we have the advocates of the 'dry' or 'whole grain' system of feeding, with the usual essentials of green food, grit, &c., and variety in the grains fed as well as manner of feeding. On the other side are those who combine the use of the mash with whole grains and the essentials. The contention of the first named is that the use of the mash is attended with injurious effect. Of the second party, that it is an important and wholesome incentive to the production of eggs in winter. The experience gained in our poultry department, after many years, points to beneficial effects when the mash is judiciously used. The following summary of the experience learned may be useful:—

1. When fed in too great quantity to one and two-year old hens it is apt to create an over-fat condition. In the case of the latter, if of the heavy breeds, this over-fat condition is likely to be fatal.

2. If fed in too great quantity as a morning ration it is likely to make the hens disinclined for exercise.

3. It is decidedly a valuable aid to moulting hens.

4. It is a convenient form of utilizing much of the farm and farm-house waste.

5. Where hens have had a comparatively free run its beneficial effect in egg production has been noticeable.

6. It is an invaluable means of quickly fattening old or young stock, in a more or less liquid form.

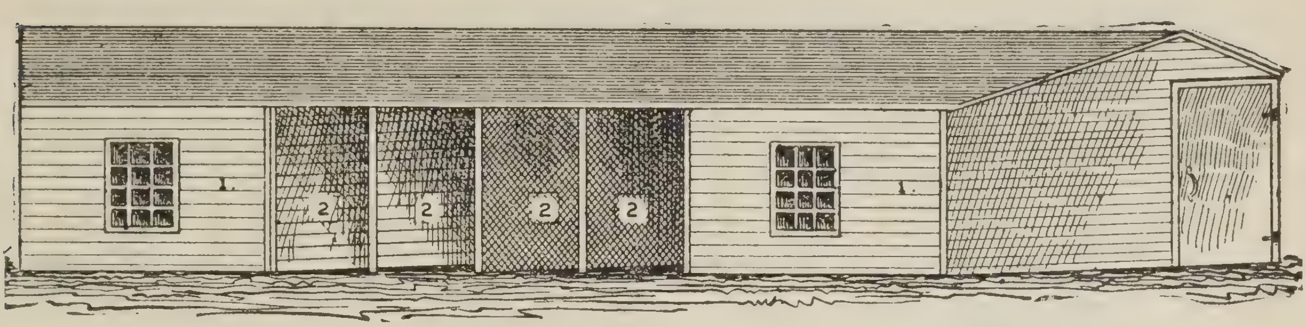
As to the quantities in which the mash should be fed, much depends upon its stimulating composition or otherwise. As ordinarily made it is composed of ground grains of different sorts with cooked roots or vegetables as a part. The mash as used by a farmer in the vicinity of Brockville, and described by him in a recent letter may be taken as fairly representative, viz.:—

'Morning ration for 250 hens and pullets, one and a quarter bushels of roots, pulped and made crumbly with provender. When provender alone is used, boiled meat is added.' The meat is presumably a form of waste. In many cases the soft feed is given in the afternoon. Under any circumstances the hour of feeding may be varied with benefit.

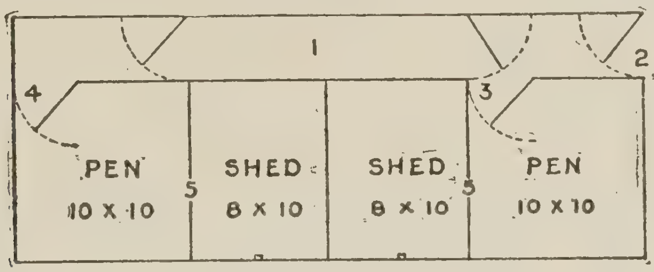
As to quantity in which it is to be fed, the practice in our department has been, when fed in the morning or at noon, to give enough to satisfy but not to gorge. Between the two extremes of too little and too much, as a morning or noon ration, doubtless lies the safety line. When fed as an afternoon winter ration, a large rather than small allowance is permissible, for there is the following long night fast to permit of leisurely assimilation. In some cases it is advisable, if the mash is fed in the early afternoon, to throw a few handsful of grain in the litter on the floor, where the layers may find it at that time, or, when daylight permits of search being made for it next morning.

A PERTINENT QUERY.

Past observation has led to the conclusion that when the feeding of the mash, or any other form of rations, has had an enervating effect on the layers that strong germs are not likely to follow. This is more likely in the case of old hens of the heavy breeds. Indeed, no hen out of condition is likely to lay an egg with a strong germ. This leads to the query, are hens while in winter quarters and laying well during that period out of condition? In a state of nature the hen is not likely to lay in winter weather. We make the conditions of her winter life as like those of spring, or early summer as possible, and we get eggs, but they are not as reproductive as desirable. Are compromise conditions in the shape of 'poultry house and scratching shed' the correct ones? And in this there is room for useful and interesting experimental work. On this point it may be interesting to note the experience of Mr. William Moe, a farmer living at Franklin, Que., where the winter is rigorous and snowfall heavy. He says: 'We send our winter eggs to a Montreal grocer and receive 40 cents per dozen for them. Our plan of feeding grain is to throw it on the floor of the "scratching shed," so that the fowls will have to work to find it. We have the scratching sheds attached to our poultry houses. We got the plans from Mr. A. F. Hunter, of South Natick, Mass.' One objection to the scratching shed attachment, in certain parts of the country, has been the exposure of the laying stock to the cold of winter, but Mr. Moe evidently does not find this an obstacle to obtaining eggs in winter. Strong advocates of poultry houses, constructed on similar plans, are Mr. L. H. Baldwin, of Deer Park, Toronto, and Mr. J. M. Wilson, Manager of the Toronto Poultry Farm. Both have adopted the principle in the construction of their poultry houses, the latter on an extensive scale. The following diagram will show a poultry house with the shed attachment:—



FRONT ELEVATION.
1. Roosting and laying room. 2. Scratching shed.



1. Passage way.
2. Door.
3, 4. Entrance to pen.
5. Passage way to sheds There may be more than one.

GROUND PLAN.

The objection to the use of the open scratching shed, in the colder parts of the Dominion, that it is too exposed to the cold and snow storms of winter has been to a great extent overcome by having a thick cotton curtain in front of each shed to be pulled down in case of a storm and rolled up on fine, sunny days. In some cases a covered shed has been found to answer. Many farmers have opportunities for allowing their fowls a run, on fine days, in an open shed with southern face. In several cases, known to the writer, farmers have their poultry houses so arranged that their fowls have regular access to open sheds into which the sun shines brightly on many winter days. In the above diagram it would be an improvement to have the roosting and laying houses the smaller of the two, and the scratching shed of the larger dimensions. It is safe to allow no less than six square feet of floor space, under any circumstances, to each hen and as much more as can conveniently be spared.

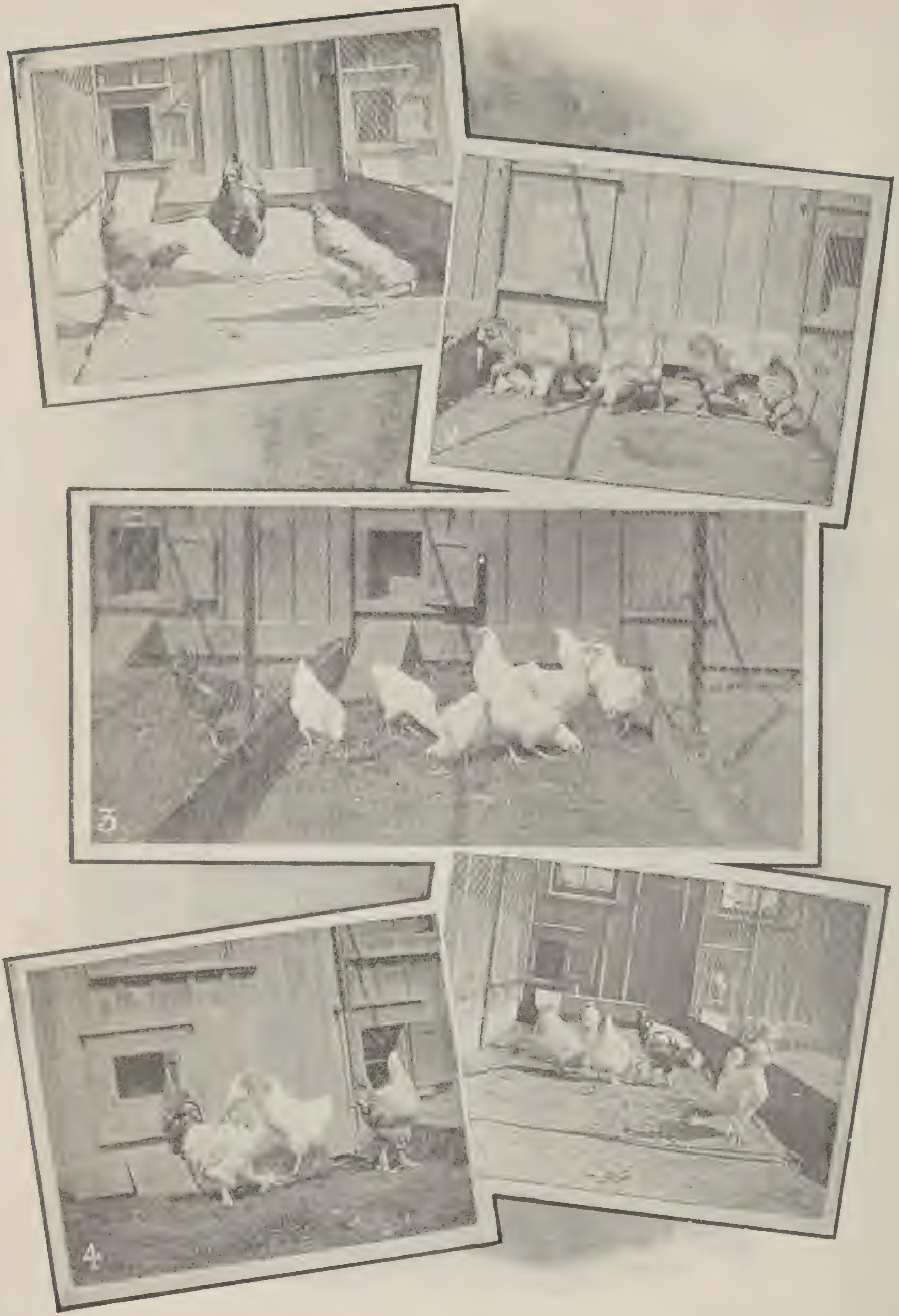
BREEDING PENS MADE UP.

On the fowls going into winter quarters the following pens of fowls were mated with vigorous young males in order to obtain, if possible, early and strong chickens. The results of this experimental work are given in previous pages:—10 White Leghorn hens, 15 Brown Leghorn hens, 10 Black Minorca hens, 6 White Minorca hens, 11 Barred Plymouth Rock hens, 8 White Plymouth Rock hens, 14 mixed hens.

In addition to the foregoing the following were added at the dates designated:—

1901.	Description.	Hens.	Pullets.	Cocks.	Cockerels.
Jan. 4	Langshans	11	....	1	
" 9	Barred P. Rocks	....	9	....	1
" 9	Buff Leghorns	9	....	....	1
" 11	Andalusians	11	....	1	
" 17	White P. Rocks	....	9	....	1
" 17	White Wyandottes	9	....	1	
" 17	Langshans	....	8	....	1
" 17	Buff Leghorns	....	8	....	1
Feb. 25	Barred P. Rocks	9	....	....	1
Mar. 20	Black Minorcas	7	....	....	1
	Crosses.				
Mar. 20	L. Brahma-P. Rock	9	....	....	1

As the hens became broody they were placed in wooden boxes, without bottoms, and with a hinged door in front. For early sitters one of the Wyandotte varieties, or one of the cross-bred hens were chosen as they were lighter than the heavier Plymouth Rocks or Leghorns. In some cases the nests were made of dry lawn clippings, which were found to answer the purpose admirably. In others oat straw was used. Three or four china eggs were placed in the nest, and on these the hen was allowed to sit for a couple of days. Meanwhile a thorough dusting of insect powder was given to both hen and nest. The powder in the feathers of the hen and in the nest probably rid her of any vermin and prevented their lodgment in the straw or grass. At end of two days the valuable eggs were given to the sitter. Food, water and grit were convenient to the sitters at all times. When the sitters left their nests to feed, generally in the morning, the eggs were examined. Should an egg have been broken it should be at once removed with the soiled straw, and the other eggs at once carefully washed in slightly warmed water and returned to the nest. Should the eggs be allowed to remain soiled no satisfactory results need be anticipated. In some cases the breast feathers of the sitters became soiled. If so they should be at once thoroughly cleaned, or the newly washed eggs will again be soiled. If circumstances will permit a number of broody hens should be set at the same time. At the end of six or seven days the eggs with light coloured shells, and at nine days the eggs with dark shells, should be tested, and the clear or unfertile ones removed. The fertile eggs should then be given to the hens which may require them, in order to have the full sitting, usually 13. The spare hens can then be reset. Egg testers can be procured, without any difficulty, from a dealer in poultry supplies. Where incubators and brooders are used, different rules as to care and management are observed. These rules accompany all the machines. But whether hens or incubators are used as hatching mediums, care and attention during the period of incubation are necessary. In too many cases the hens, or incubators, have to bear the blame that rightfully should be borne by manager or operator.



1. Buff Orpingtons.
2. L. Brahma and B. P. Rock Crosses (Cockerels).
3. White Wyandotte Pullets.
4. Cross Bred Cockerels Fattening.
5. Salmon Faverolles.

EGGS SET AND CHICKENS HATCHED.

The following list will show the number of eggs set and result in chickens:—

Date.	Description of Eggs.	When Hatched.	No. of Chicks.
Mar. 26........	13 White Plymouth Rock eggs..........................	April 16	5
" 27........	13 White Wyandotte eggs..................................	" 17	9
" 27........	13 Barred Plymouth Rock eggs............................	" 17........	8
April 18........	13 " " from Grand Pré, N.S......	May 9........	8
" 18........	13 " " "	" 9........	10
" 19........	13 White Wyandotte eggs...............................	" 10........	8
" 19........	13 White Plymouth Rock eggs............................	" 10........	10
" 22........	13 Buff Leghorn eggs..	" 13	10
" 30........	13 Light Brahma-Plymouth Rock eggs....................	" 20........	12
" 30........	13 " "	" 20........	8
May 1........	13 Barred Plymouth Rock eggs..........................	" 21........	9
" 1........	13 Buff Leghorn eggs..	" 21........	9
" 2	13 Barred Plymouth Rock eggs..........................	" 23........	10
" 2........	13 White Leghorn eggs..	" 23	11
" 2	13 Buff "	" 23........	8
" 4	9 Light Brahma—4 White Wyandotte eggs............	" 25........	7
" 10........	14 Barred Plymouth Rock eggs	" 31........	11
" 11........	15 Light Brahma—Plymouth Rock cross eggs............	June 1........	11
" 11	13 Black Minorca eggs from Gatineau Point............	" 1.	3
" 13	13 White Wyandotte eggs....................................	" 4	7
" 13........	13 White Leghorn eggs..	" 4........	7
" 15	13 Barred Plymouth Rock eggs from Ottawa East	" 6	7
" 18........	15 Buff Leghorn eggs from Cobourg........................	" 9........	7
" 22........	13 Barred Plymouth Rock eggs from Ottawa............	– 13........	10
" 23........	13 White Wyandotte eggs....................................	" 14........	9
" 24........	13 " "	" 15........	8
June 18........	13 Barred Plymouth Rock eggs from Ottawa	July 10........	11
" 18........	13 " "	" 10........	8
" 21........	7 Barred Plymouth Rock—8 White Wyandotte eggs.....	" 12........	10
	384		251
	(A little over 65 per cent of the above eggs hatched.)		
	Incubator-hatched chickens..................................	....	145
			396

After hatching, the chicks were allowed to remain under the hen, or in incubator, until strong on their legs. This may be 24 or 36 hours after coming out of the shell. If incubator-hatched the chickens were removed to brooders, which, if the season was advanced enough, were placed outside. If hen-hatched, and the weather permitted, the mother hen and her brood were placed in coops which were put on the grass of a field. The grass in this portion of the field was kept short by grass mower, and the field was surrounded by wire netting. The coops had slatted fronts and were so arranged as to permit of their being securely fastened at night, while abundant ventilation was provided. From time to time the coops were moved to new ground. As in past years on removing the hen and her brood from the nest, the hen was given food and water before placing her in the coop with the chicks. She had been on the nest for 36 hours, hatching out her chicks, and during that time had partaken of no food or drink, and was probably much in need of both. If not so fed she is likely to greedily eat up the comparatively dainty food intended for her brood. Again, her hunger and thirst being appeased she was much more likely to brood her chicks in quiet than if allowed to remain in want of food and drink. The first feed of the chicks was stale bread crumbs, followed some hours later by stale bread soaked in skimmed milk and

squeezed dry. This was fed a little at a time and often. Never in quantity enough to gorge, and none was allowed to remain about to turn sour. After a day or two granulated oatmeal was given, and when convenient boiled rice. This food was given for a week or ten days when a change was gradually made to a mash composed of stale bread, oatmeal and cornmeal mixed with skimmed milk and fed in a crumbly condition. Skim milk and water with fine grit were also provided. No grain was given until the 12th or 14th day, and then it was fed a little at a time and at night, until the chicks were accustomed to it, when they were sent to brood for the night with their crops full. Wheat was found the most satisfactory grain. As his chicks progress the farmer should be able to utilize the table and kitchen waste, such as broken crusts, potatoes, potato peelings, unused oatmeal or cornmeal porridge, &c., &c., with great benefit. Salt and fat meat should not be used, and the peelings, &c., thoroughly cooked. The feed should be wholesome, plain, nutritious and need not be expensive. The chickens require care and attention during the first five weeks of their growth, for during that period they are slowly but surely feathering. The chicks of the Leghorn and kindred types will be found to make the most rapid development during the first few weeks, but those of the heavier breeds, such as Plymouth Rocks, Wyandottes or Orpingtons, will later on more than compensate by gain in weight. The mother hens should be allowed to remain with their chickens until the latter are fully feathered. They should then be removed to the runs with the other hens, and if in good condition by this time should be laying or about to do so. With such care and treatment as outlined at end of three or three and a half months the birds should be ready for sale, to either private customer, to city store, or to one of the large purchasing companies, which are being formed in different parts of the Dominion. At the age mentioned and with the care and food as advised, the young cockerels of the Plymouth Rock and Wyandotte breeds and Buff Orpington variety should weigh 3½ pounds or 4 pounds each. And the earlier they attain these weights the better price will they bring. A good plan is to put the chickens in crates and feed them well for three weeks before selling them. The benefit of so doing is shown further on.

WEIGHT DEVELOPMENT OF THE CHICKENS.

Treated and cared for as outlined from time of hatching the farm chickens made rapid and satisfactory development, as the following figures will show. The chicks were hatched in incubators and reared in brooders, while others were hen-hatched and reared.

Incubator-hatched on 26th February. Weighed on 4th June following, 3 months and 5 days of age.

	Lbs.	Oz.
Barred Plymouth Rock Cockerel	3	5½
White Wyandotte Cockerel	3	5½
Light Brahma—B. P. Rock Cross-Cockerel	3	5
Light Brahma—C. Dorking Cross-Cockerel	3	8

Such chickens as the above would command a handsome price, but as they require special facilities to rear them during the month of March and the early part of April, the farmer with his ordinary means is not likely to have them. But with the aid of incubator and brooder the farmer should be able by the first or second week in May, most likely earlier, to have a large number of chickens hatched and growing rapidly in a brooder, or brooders, with opportunity for the young birds to run out on the rapidly

growing grass. By means of hens he is not likely to have similar results, for it is only the winter layers which will make the early sitters, and then only in limited number. The non-winter layers beginning their output of eggs in spring, will lay their quota before becoming broody, and their chickens are more likely to be brought out in mid-June than early May.

Proof of this will be found by reference to the table of eggs set and chickens hatched, to be seen in a preceding page. This table shows that three early sitters were available on the 26th and 27th March. They were placed on eggs at the dates mentioned, and hatched out 22 chicks in April. Four other sitters were set on 18th and 19th of April, and hatched 36 chickens, making with the 22 chickens hatched in April a total of only 58 chickens by middle of May. And the hens of the poultry department had laid fairly well during the previous winter. With the same percentage of strong germs, which gave 8 and 10 chicks out of 13 eggs, as the table also shows, and an incubator of 220 egg capacity the farmer should have 170 to 175 strong and robust chickens. The moral is obvious.

PROGRESS MADE BY CHICKENS FED IN CRATES.

On the 1st day of August the four cockerels hatched in an incubator on 26th February, were put in fattening pens upstairs, and were hand fed three times per day on a ration of two parts ground oats, one part shorts, one part cornmeal, the whole being mixed with skimmed milk. Quantity fed per day, one pound. The following gains were made:—

Varieties.	Aug. 1.		Aug. 7.		Aug. 15.		Aug. 21.		Aug. 28.		Sept. 4.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
1. Light Brahmas and P. Rock cross..	5	10	6	1	6	9	6	12½	6	14½	7	3½
2. " C. Dorking cross	5	12½	6	5	6	12½	7	2½	7	9½	7	12½
3. White Wyandotte......	5	12½	6	2½	6	10½	6	14½	7	4½	7	9
4. White Plymouth Rock.............	4	5	4	5½	....		4	14½	5	2½	5	9½

Soon after being put into the pen the White Plymouth Rock cockerel became sick, and was replaced on 21st August by another of the same breed.

All the birds were moulting previously to, or began to moult heavily soon after being placed upstairs. This, no doubt, was a drawback to rapid flesh making. The lesson taught by this experience is that birds should be put into the fattening pens either before or after they begin to moult, at 4½ or 5 months of age, preferably the earlier period.

EXPERIMENTS WITH BIRDS IN FATTENING CRATES, LIMITED AND UNLIMITED RUNS.

In order to ascertain the difference in gains made by birds in fattening crates, limited and free runs, the following comparative tests were made:—On 12th August two groups of 4 chickens in each group, and of same age, viz., 4 months and 3 days, were selected and bands with distinguishing numbers placed on one of the legs of each bird. The rations were composed of coarsely ground grains, such as farmers would likely have at hand, and of the following description and quantity, viz.:—2 parts cornmeal, 1 part coarsely ground oats, 1 part shorts or buckwheat meal.

GROUP 1.—In fattening crate upstairs.

Variety.	Aug. 12.		Aug. 19.		Aug. 26.		Sept. 2.		Sept. 9.		Sept. 17.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
No. 34. White Wyandotte	4	10½	5	00	5	4½	5	6½	5	7½	5	12½
No. 33. "	4	6½	4	13½	5	6½	5	12	5	14	6	3½
No. 39. "	4	2½	4	10½	5	2½	5	½	5	4	5	10
No. 47. Barred Plymouth Rock	5	2½	5	9½	6	0	6	5½	6	10	7	0

GROUP 2.—Limited run.

No. 30. White Wyandotte	4	1½	4	9	4	13	5	2½	5	4½	5	8
No. 40. "	4	1½	4	7	4	11½	4	14	5	0	5	2
No. 61. "	3	11	4	0	4	3	4	9½	4	12½	5	2
No. 67. "	3	14½	4	4	4	8	4	10½	4	15½	5	2

The following will show the gains made by chickens placed in fattening pens upstairs and others on a free run. On 19th of August four Light Brahma B. Plymouth Rock cross-bred cockerels, incubator-hatched, were picked from a number running in a field. The birds were all three months of age. Leg bands with distinguishing numbers were placed on the chickens. Two were placed in fattening crates upstairs, and the other two were allowed to run in a field. The following figures will show results:—

In Fattening crate upstairs.

Variety.	Aug. 19.		Aug. 26.		Sept. 2.		Sept. 9.		Sept. 17.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
No. 2. Light Brahmas-Plymouth Rock cross	3	9	4	2½	4	10½	4	15½	5	7
No. 3. " " "	3	10	4	4½	4	12½	5	4½	5	13½

Allowed free run.

No. 50. Light Brahmas-Plymouth Rock cross	3	8½	3	14	4	5	4	7	4	13½
No. 9. " " "	3	3½	3	9	4	0	4	0	4	3½

BUFF ORPINGTONS, RHODE ISLAND REDS AND SALMON FAVEROLLES ON TRIAL.

During the latter part of the summer season three comparatively new comers were added to our poultry department, viz., Buff Orpingtons, Rhode Island Reds and Salmon (or Saumon) Faverolles. Briefly described some of the characteristics of the new varieties are as follows:—

BUFF ORPINGTONS.—One of three varieties of a well-known English breed composed of White, Black and Buff varieties. They are strongly recommended as winter layers and rapid flesh formers. The Buff variety have light legs and a white flesh which make them particularly suited to the requirements of the English, as well as home markets. Figures showing flesh development are given further on.

Rhode Island Reds.—As their name indicates is of eastern United States origin, and are said to be good winter layers, hardy and quick growers. Owing to a pronounced yellow colour of leg and tinge of flesh, they are likely, for the present at any rate, as a market fowl to be more suited to the United States taste for yellow skin, than for export. This at once limits their field of usefulness as compared with the Buff Orpington.

Salmon Faverolles.—Are of French origin, although bred for some time past in England. They are the first of this breed to be brought to Canada, and are found in only one place in the United States, viz., the States Valley Farm of Simsbury, Conn. The Salmon or Saumon Faverolle is the most preferable of several types. It is a mixed breed with Houdan, Dorking, Brahma, and may be Cochin, showing in one fowl. Their merit is said to be that of a table fowl of small bone and fine quality of flesh. And undoubtedly they are such. In the Parisian market they bring the highest price. Mr. T. H. Robinson, the English Faverolle breeder, says of them : 'that they will attain a size and weight, with less trouble, than some of our finer breeds and a young fowl of this breed will leave nothing in the way of quality to be desired.'

FLESH DEVELOPMENT OF FOUR BUFF ORPINGTON COCKERELS.

With a view of finding out their merit as flesh formers, on the 26th August four Buff Orpington Cockerels were purchased from a breeder near the city. They were hatched on 1st of June, and had received no special care or feeding. One bird showed evidence of neglect.

Four Buff Orpington Cockerels hatched 1st June, 1901. Placed in pen with Limited run on 2nd September following at 3 months and 2 days of age.

Variety.	Sept. 2.		Sept. 9.		Sept. 16.		Sept. 23.		Oct. 2.	
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.
No. 21	3	7½	3	12½	4	4	5	½	5	10½
No. 12	3	12½	4	½	4	9	5	½	5	11
No. 20	3	9½	3	15½	4	6	5	3½	....	.....
No. 25	2	13½	3	2	3	8½	4	2½	4	12

These birds were not weighed again until the 11th November following, at age of 5 months and 11 days, when they were compared with White Wyandotte cockerels of age of 7 months and 2 days. Conditions as to care and feeding were the same in both cases.

Four Buff Orpingtons, at age of 5 months 11 days:—

	Lbs.	Oz.
No. 21	7	2
No. 12	7	2½
No. 15	6	½
No. 20	5	10

Four W. Wyandottes, 7 months 2 days old:—

	Lbs.	Oz.
No. 61	7	2
No. 67	6	13½
No. 40	6	7½
No. 30	7	4½

PROGRESS OF SIX RHODE ISLAND RED COCKERELS.

Six Rhode Island Red Cockerels hatched at different times during the month of May, were purchased from a breeder in Nova Scotia, and had been taken from a free run in the fields when shipped. They were strong and healthy chickens, but thin when received on 27th September. On the 4th of October they were placed in a pen, with limited outside run, when the following flesh development was made. Rations same as given to other chickens, viz., 2 parts coarsely ground oats, 1 part cornmeal, 1 part shorts. This ration was altered from time to time, ground barley sometimes taking the place of shorts and cornmeal at others.

SIX RHODE ISLAND REDS PLACED ON LIMITED RUN.

—	Oct. 7.	Oct. 14.	Oct. 21.	Oct. 28.	Nov. 4.	Nov. 11.
No. 16	4	4·14	5·12	6	5·14	6
" 14	4·4½	5·6½	6	6·6	6·14½	6·14
" 25	5·3½	6	5·2	5·14½	6·7½	6·7½
" 27	3·12	4·7½	4·12½	4·15½	4·15½	5
" 39	4·7½	5·2	4·12½	5·4½	5·3½	5·8
" 8	4·12	5·10½	5·11½	6	6·3½	6·5

A THREE MONTHS OLD CHICKEN WANTED.

The large poultry purchasing companies in Canada call for a three months old chicken as being best suited to the wants of a certain class of customers in our home and the English markets. The chickens are wanted early and in numbers. There should be no difficulty in our farmers having such chickens by end of July or beginning of August. A fear has been expressed that a chicken of this age will not have weight. The following is the best answer. It is a result that has been attained in our department for many years, and not only by us but by many farmers:—

Barred P. Rock Cockerel, hatched 10th May; weight on 10th August, 3 pounds.

White P. Rock Cockerel, hatched 10th May: weight on 10th August, 3 pounds.

Barred P. Rock Cockerel, hatched 17th April ; weighed on 17th July, 3 pounds 6 oz.

White Wyandotte Cockerel, hatched 17th April; weight on 17th July, 3 pounds 5 ounces.

White Wyandotte Cockerel, hatched 17th April; weight on 17th July, 3 pounds 4 ounces.

L. Brahma P. R. Cross-Cockerel, hatched 17th May; weight on 19th August, 3 pounds 9 ounces.

L. Brahma P. R. Cross-Cockerel, hatched 17th May; weight on 19th August, 3 pounds 10 ounces.

COMPOSITION OF FARM RATIONS AND MANNER OF FEEDING THEM.

The composition of the farm rations at present being fed, with the view of egg production, is much the same as those of previous years, but the time of feeding slightly differs. Last year mash was fed to the hens in the morning three times per week. On the remaining mornings cut green bones were given instead. At noon a light feed of oats, and at night whole grain. The pullets received mash twice per day in small quantities, and cut bone three times per week, with whole grain for afternoon ration.

When cut bone was given the mash was not fed. But this treatment was found too fattening for the Plymouth Rock pullets, and the rations and times of feeding them were made the same as with the older stock.

The rations this year are fed as follows:—

To 110 Hens, One to Two Years Old.—In morning, 8 pounds wheat. Noon, 5 pounds ground grains (measured dry) made into mash. Afternoon, 8 pounds wheat or buckwheat. Three times per week 8 pounds cut bone are given in lieu of the mash. Mangels regularly given and pure water, grit and ground oyster shells are in abundant supply. Sometimes steamed lawn clippings take the place of the mangels. The ground grains for the mash are 2 pounds coarse ground oats, 2 pounds cornmeal, 1 pound shorts.

The reason for feeding the whole grain in the morning is that scattered in the litter on the floors of the pens, the hens start at once to search for it, and exercise is so induced. The whole grain in the afternoon is calculated to send the fowls to roost with their crops fairly well filled.

To 150 Pullets of Different Ages.—Morning ration 10 pounds grain, principally wheat. Noon, 10 pounds mash. Afternoon, 10 pounds grain. Three times per week 10 pounds of cut green bones take the place of the mash. The ground grains composing the mash are: Cornmeal, 5 pounds; coarsely ground oats, 3 pounds; shorts, 2 pounds.

The essentials such as roots, grit, oyster shells and pure water are in regular supply. The reason for adopting the above method of feeding the pullets is the same as in the case of the hens.

COST OF RATIONS.

Every effort has been made to have the rations as cheap and effective as possible. All kinds of feed are, at time of writing, and have been for some months exceptionally high and in sympathy therewith the price of eggs and poultry has risen above the average of previous years. Calculating at present values, the price of the rations is put as follows:—

RATIONS FOR 110 HENS FOUR TIMES PER WEEK.

	Cts.
16 pounds wheat at 75 cents per bushel	20
5 pounds ground grains for mash	6
Lime, grit, mangels, &c	3
	29

OTHER DAYS.

16 pounds wheat	20
8 pounds cut green bone at 1 cent per pound	8
Lime, grit and mangels	3
	31

RATIONS FOR 150 PULLETS FOUR TIMES PER WEEK.

20 pounds wheat	25
10 pounds mash	12
Lime, grit and mangels	37

When mash is not fed on remaining three days it is replaced by 10 pounds cut green bone at 1 cent per pound, 10 cents.

To the price of the cut bone is to be added the cost of cutting it, which would be the time of a man for an hour three times per week.

WHEN THE PULLETS BEGAN TO LAY.

The pullets hatched in incubator on 26th February, laid as follows:—

1 Brown Leghorn pullet (4 months 20 days old), July 17, 1901.
2 White P. Rock pullets (5 months of age), July 28, 1901.
1 Cross-bred pullet (5 months of age), July 28, 1901.
1 White P. Rock pullet (5 months 3 days old), August 1, 1901.

Other pullets laid at the following dates:—

Buff Leghorn, hatched 23rd June; 21st November.
Rhode Island Red, hatched in May; 25th November.
Langshan, hatched in April; 1st December.
White Wyandotte, hatched in May; 2nd December.
B. P. Rock, hatched in May; 3rd December.
White Leghorn, hatched 4th June; 7th December.

In August last, 4 Buff Orpington and 4 Faverolle pullets were imported from England. On September 2, the month following one of the Buff Orpington pullets, laid and continued to do so until the 13th of the same month when she became broody, but was broken up. The pullets were evidently early hatched, and it is quite possible that she may have been laying before leaving England.

On the 9th September, a Faverolle pullet laid apparently her first egg.

DID THE EARLY HATCHED PULLETS MOULT?

The early incubator farm hatched chickens (26th February) did moult in the fall, and while doing so ceased laying. The cross-bred pullet laid but a few eggs when it became broody, but was put in a pen by herself and broken up. The imported Orpington pullets, although apparently early hatched, did not moult. The Faverolle pullets began to moult on going into winter quarters. Further experience is required before a decision can be arrived at as to whether the early incubator-hatched pullets are better for fall layers, when the majority of hens are moulting, than late April or early May-hatched birds. If the early incubator-hatched pullet begins to lay in July or August, when eggs are cheap, and commences to moult in October or November, when the price of eggs is becoming higher, the later May-hatched chicken, which usually begins to lay in November and continues to do so without stoppage, is the more valuable bird of the two. But this remains yet to be decidedly proved. On this point the experience of those who have had early hatched-incubator chickens would be very acceptable and useful. It is a matter of no little importance.

GOOD LAYING BY THE BUFF ORPINGTON PULLETS.

During the fall months the Orpington pullets, with one exception, laid from time to time and were not pushed to do so. The exception was a pullet which had evidently become sick on the voyage out, for she had incipient roup on her arrival at our poultry department. She was at once separated from the rest, and with care and treatment was brought to comparatively good condition. She was put with the others in the second week of December, and soon after began to lay.

The record of three pullets for the first half of the month of December, and of the four for the latter portion is as follows:—

—	—																															Total.
Days of the month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
No. of eggs laid by 4 Buff Orpington pullets in Dec., 1901..........	2	3	1	3	2	2	2	3	2	1	1	2	2	2	2	2	2	2	2	2	2	1	3	3	2	2	4	4	2	1	3	67

AN EARLY MOULT—COMMENCEMENT OF WINTER LAYING.

The one and two-year old hens moulted early, and went into winter quarters in good condition. Winter laying commenced on the 23rd of November. At that time the weather had turned cold and there was a snow fall which necessitated the closing in of the different pens for the winter.

Every effort was made to shorten the moulting period, which is really one of non-production, and gratifying success was attained. The following treatment was adopted. During the first week in July the sending out of eggs for hatching purposes had ceased, and the breeding pens were broken up, the male birds being removed to a building with small pens and limited runs. The hens were allowed to run in small fields in rear of the poultry buildings. During the first two or three weeks in July their rations were reduced one-half, the mash being fed only once per week, and one-half in quantity. At end of July the full rations were resumed, and the mash was fed three times per week, but was mixed with cold instead of hot water. As it was not convenient or desirable to feed cut bone during the hot weather of August, a preparation of meat (Spratt's Crissell) was mixed in the mash, in the proportion of 3 to 5 pounds per hundred hens. The half rations were ½ pound wheat or buckwheat to every 15 hens of the Mediterranean classes, and to every 20 hens of the heavier breeds. When buckwheat is used in summer it is better to mix oats with it. The half ration of mash was fed in the same proportions. Bran was used as a part of the mash. The full ration of mash was composed of coarsely ground oats, 2 parts; shorts, 1 part; cornmeal, 1 part, with Spratt's Crissell in quantity of one pound to every 15 or 20 hens. Pure water for drink was always at hand. The fields furnished clover and grass. The response to this treatment was the shedding of the old feathers and the appearance of the new ones. By the end of September or first week in October, some much earlier, the hens were over their moult and looking remarkably well. From the results obtained and observation during the moult it seemed as if it were possible to shorten the season of non-production to a still greater extent. One result in the shortening of the rations was to at once reduce the egg production to almost nothing. The remarks of Dr. N. W. Sanborn, a recognized authority of the United States, in his work on 'Poultry Diseases,' says of the moulting period: 'So many birds pass through the moulting process with difficulty, if not disease, that it is well to call attention to it. A moulting hen is easily fattened. Hence, at this period, feed lightly of those foods which produce fat. Corn, cornmeal, middlings, potatoes, must be used sparingly. Increase the amount of green bone, bran and skim milk. A run in a field of clover will be a help. Do not try to hasten the time of the moult by keeping in a warm pen or by feeding cotton seed or linseed meal. Keep all males by themselves during the moulting season. The hens should be sheltered from storms or cold rains. The ideal place for a run is an apple orchard where in addition to the grass may be found insects in fallen fruit, &c. Birds should go into the moult not fat, free from lice and with no red mites in the house.' This extract was given in report of 1896, but is valuable enough to warrant its repetition.

RED MITES. AN INQUIRY AND REPLY.

The following note and answer will convey information that will doubtless be useful to many poultry keepers:—

'Elgin, Ont., December 23, 1901.

'Manager Poultry Dept.,
'Experimental Farm, Ottawa.

'Sir,—Will you be kind enough to tell me what will get rid of lice on hens and in their house? In the summer the house and roosts swarmed with little insects that could scarcely be seen. And they are still in the house. If I go in I am covered with them. I have used a good deal of stuff, but cannot get rid of them. Hoping to get a remedy for them.

'J. J. K.'

A reply was sent that the fowls should be carefully dusted with carbolic powder. If the fowls were in large numbers one of the liquid preparations was advised as the most speedy way in which to meet the difficulty. These liquid lice-destroying preparations have, in recent years, been put upon the market and are said to be efficient. For red mites the following remedy was advised:—A solution of

Corrosive sublimate	4 ounces.
Common salt	4 "

Dissolve in two to four quarts of water. When completely dissolved dilute to 25 gallons.

With this carefully spray every crevice, nook and corner of the house.

As the solution is highly poisonous, care should be observed in handling it.

Follow by whitewashing the premises. Before returning the fowls to the poultry-house see that they are entirely free from vermin. This treatment has been found efficacious in many cases, and is the quickest and surest method of getting rid of the troublesome pests. A good plan to prevent the lodgment of lice on the roosting places and platforms is to dampen both roosts and platforms once every ten or fourteen days with coal oil. Scaly leg will also be prevented.

DISEASES OF POULTRY.

Symptoms of many diseases of poultry were described and remedies asked for during the year. Many of the ailments were forms of liver affection due to overfeeding and lack of exercise, particularly in the case of two and three-year old hens of the heavier breeds. A liver pill and a change in the manner of feeding the rations and quantity fed were advised. Many cases of cold and slight catarrh were also reported. In such cases the removal of the cause, if apparent, was advised with the use of a good condition powder and roup pills, when easily procured. Coal oil in the incipient stages is recommended.

STOCK ON HAND IN DECEMBER.

Breeds.	Hens.	Pullets.	Cocks.	Cockerels.
Barred P. Rocks	10	30	1	12
White "	8	14	....	4
Buff P. Rocks	....	7	....	1
White Wyandottes	10	18	1	15
Langshans	10	6	1	2
Light Brahmas	....	....	1	
Faverolles	....	4	....	1
Buff Orpingtons	....	4	....	2
Brown Leghorns	8	6	1	2
White "	4	10	1	6
Buff "	14	12	1	3
Andalusians	8	....	1	1
Black Minorcas	8	3	1	
White Indian Games	6	....	1	
White Minorcas	5	....	1	
Rhode Island Reds	....	7	....	4
L. Bra.-P. Rock Cross	3	15	....	1
Mixed Fowls	19			
	113	136	11	54

Eggs laid by different breeds from December 1, 1901, to June 30, 1902.

Breeds.	1900.	1901.						Totals.	Remarks.
	Dec.	Jan.	Feb.	Mar.	April.	May.	June.		
10 W. Leghorn hens	24	38	34	70	135	141	73	515	
10 B. Minorca hens	61	96	120	145	135	100	65	722	
5 " pullets	......	36	68	73	76	38	65	356	
9 Andalusian hens	2	34	53	83	115	104	87	478	
15 Brown Leghorn hens	39	87	101	168	192	207	129	923	
7 Langshan hens	5	68	70	79	67	40	21	350	As the season advanced the hens of the setting breeds became broody and were given eggs, or broken up.
7 " pullets	10	71	47	64	81	87	34	394	
11 B. P. Rock hens	35	35	48	85	87	73	65	428	
20 " pullets	80	299	312	281	218	141	45	1,376	
8 W. P. Rock hens	38	74	68	82	94	98	49	503	
6 " pullets	5	44	59	64	67	57	53	349	
4 W. Wyandotte hens	35	63	56	54	5	Broody.		213	
12 " pullets	5	68	124	129	157	75	56	614	
6 W. Minorca hens	13	51	43	61	69	55	54	346	
6 Buff Leghorn hens	47	61	56	74	80	60	45	423	
10 " pullets	55	81	94	90	110	62	57	549	
14 Mixed hens	55	82	133	189	189	118	90	856	These hens were mostly first crosses.
11 " pullets	12	90	130	144	216	174	105	871	
8 White Ind. Game hens.	30	52	34	109	110	53	75	463	
	551	1,430	1,650	2,044	2,203	1,683	1,168	10,729	

NUMBER of Eggs Laid from December 1, 1900, to November 30, 1901.

1900.	
December	551
1901.	
January	1,430
February	1,650
March	2,005
April	2,126
May	1,711
June	1,134
July	465
August	335
September	181
October	222
November	198
	12,008

Experiments in preserving eggs, by Mr. F. T. Shutt, Chemist of the Experimental Farms, have been continued during the past season, and a report made by Mr. Shutt on this subject will be found appended.

OTTAWA, December 28, 1901.

THE PRESERVATION OF EGGS BY FRANK T. SHUTT, M.A.,

Chemist, Dominion Experimental Farms.

The results of the experiments in egg preservation commenced in 1898 and continued in 1899 and 1900, have already been published in the annual reports of the Experimental Farms. They go to show that of all the preservative fluids and methods used none gave such uniformly satisfactory results, as regards quality of the preserved egg, as saturated lime-water, and, further, that this was the least expensive and most pleasant to handle of all the fluids employed.

Further trials have been made during the past season, using (1) lime-water, (2) lime-water containing 1 per cent common salt, (3) lime-water containing 2 per cent common salt, (4) common salt, 1 per cent, (5) common salt, 2 per cent. We also tested the efficacy of the following methods:—(6) smearing the eggs with vaseline and (*a*) immersed in lime-water, and (*b*) set away in rack, (7) covered with paraffin and immersed in lime-water, and (8) dipping in saturated solution of potassium permanganate and set away in rack, (9) sodium aluminate, 5 per cent solution. The experiments began May 14, 1901, and the eggs were examined on December 14, 1901, a period of 7 months.

Saturated Lime-water.—'White,' somewhat more limpid than in fresh egg and tinged faintly yellow. Yolk, globular, and in one or two eggs, attached to shell. No offensive smell, and appearance, both externally and internally, good. Discoloration of 'white' somewhat more pronounced on poaching with development of very faint musty odour. Though not equal to fresh egg in flavour, they are quite usable and in no degree offensive.

Saturated Lime-water, containing 1 per cent common salt.—Very good as to appearance, both externally and internally; 'white,' very slightly tinged, but a little more limpid than in saturated lime-water alone. Yolk, globular; air-space, normal. Faint odour, somewhat more strongly marked on poaching. Nothing disagreeable in uncooked or cooked egg; quite usable, but lacking the flavour of a fresh egg. Compared with eggs in saturated lime-water only, they are on the whole perhaps slightly superior.

Saturated Lime-water and 2 per cent common salt.—'White,' quite limpid and slightly brownish. Fairly well preserved, but not equal to eggs in either of the foregoing liquids.

Common salt, 1 per cent solution.—In appearance, both externally and internally, four of the eggs were very similar to those kept in lime-water, but they possessed a more marked musty odour. In two of the eggs the 'white' was limpid and yellowish, the yolk had lost its globular form, and the smell was disagreeable.

Common salt, 2 per cent solution.—'White,' very limpid. Yolk, reddish-black and of the consistency of jelly; very bad smell. All the eggs were quite spoilt and unusable.

Eggs smeared with vaseline and kept in lime-water.—'White,' more markedly discoloured than those in lime-water simply; musty smell, somewhat inferior to eggs kept in lime-water without vaseline covering.

Eggs smeared with vaseline and kept in rack.—'White,' slightly discoloured; possesses faint musty odour, but fairly good; apparently somewhat better than eggs in preceding test.

Eggs covered with paraffin and kept in lime-water.—'White,' slightly tinged with yellow; yolk, thin and degraded in one or two of the eggs; musty smell. Eggs decidedly inferior to those in lime-water simply. External appearance rough and unattractive, due to paraffin.

Eggs dipped for half a manute in saturated permanganate of potash solution, and kept in rack.—Eggs considerably dried in, air-space abnormally large, showing the 'white' very limpid and quite discoloured; very musty odour. The majority of the eggs were considered as decidedly bad and unfit for use.

Sodium aluminate, 5 per cent solution.—'White,' slightly tinged; general appearance, good; faint musty odour.

CONCLUSIONS.

The preservative solutions that gave the best results were lime-water and the lime-water containing 1 per cent salt. There was not much difference between the eggs, cooked or uncooked, to sight, smell or taste, kept in these two solutions, but such as there was, we considered, showed the eggs in the latter to be slightly the better.

The addition of salt to the lime-water to an extent exceeding 1 per cent would appear to be no advantage; indeed, when the salt present amounted to 2 per cent we noticed that the quality of the preserved eggs had suffered. The 1 per cent solution is prepared by dissolving $1\frac{1}{3}$ ounces of common salt in each gallon of the saturated lime-water.

The common salt solutions without lime, both 1 per cent and 2 per cent, caused the eggs to have a more marked and disagreeable odour, especially on cooking. All the eggs in the 2 per cent fluid were unusable.

Vaseline-covered eggs were not quite as well preserved as those simply in lime-water.

The paraffin-covered eggs were decidedly inferior to those simply preserved by lime-water.

The eggs dipped in a solution of permanganate of potash were decidedly bad, showing that the claims for this much vaunted chemical are without foundation.

In summing up the conclusions from the work of 1901, we feel justified in repeating the statement that saturated lime-water is a most effective preservative. We can further say that it is a cheap, easily prepared and pleasant fluid to handle. The addition of a small amount of salt (not exceeding 1 per cent) appears to be an advantage, but a larger amount—even 2 per cent—of salt is decidedly detrimental to the quality of the preserved eggs.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES

REPORT OF R. ROBERTSON, SUPERINTENDENT.

NAPPAN, N.S., November 30, 1901.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my third annual report, it being the fourteenth annual report of operations on the Experimental Farm for the maritime provinces at Nappan, N.S.

The season was not favourable for the majority of crops, although especially favourable for hay and corn. The early wet spring benefited the hay crop, which was good, especially on the upland.

The early grain was quite promising until toward reaping time, when the continuous warm dry weather caused it to ripen prematurely; the result being that most of the grain was light per bushel, and did not yield nearly as many bushels as was expected. The late sown grain was extremely poor. Roots were a fair crop. The field corn was the best we have ever had. The warm weather was extremely favourable for this crop, which matured well.

The catch of clover was fairly good, but has made nothing like the usual growth.

The after grass was very poor, and as a result all cattle in this section are very much thinner in flesh than they have been at the same period during the last four years.

About the usual number of people visited the farm this year. The largest excursion for the season was from Fox Creek, N.B., on July 20. Many smaller groups or picnics, of from 20 to 100, came from time to time during the summer.

I again wish to acknowledge the valuable services of Mr. Thomas Coates, farm foreman, who kept records of all grain experiments, and took charge of general farm work, and of Mr. Robert Donaldson, herdsman, under whose charge all the experiments with stock were carried on.

WEATHER.

December commenced quite cold, moderating, however, on the 4th, with a drifting snow storm on the 5th. This made very good sleighing, which continued for the winter.

The thermometer registered 3° below zero on the 9th, and continued below zero until the 12th, when 12° below zero was reached. It soon moderated somewhat, and on the 14th we had another snow storm which made good roads.

The thermometer again went below zero on the 16th, and on the 18th 11° below zero was reached.

The month from this time out was not very cold, with the exception of the 28th, when zero was again reached.

The 2nd and 3rd of January, registered 2° and 6° below zero respectively. It kept quite cold and fine until the 12th and 13th, when a heavy drifting snow storm made it necessary to break out roads, which were drifted full in many places. The mercury

fell to zero on the 14th, and 9° below on the 15th, 6° below on the 19th, and 10° below on the 23rd. The weather was again fine until the 25th, when it came in mild, with rain on the 26th and 27th, turning cold again, however, and continuing so until the end of the month.

There was a heavy fall of snow on the 3rd of February, which made road breaking again necessary, and on the 8th another snow storm blocked the roads. With one exception the balance of the month was fine and moderate, but the temperature fell to 3° below zero on the 23rd, followed with moderate weather and a heavy storm on the 24th, which again drifted the roads full of snow.

March started fine but cold, moderating somewhat until the 7th, when the thermometer fell to 10° below zero. It soon moderated again, and on the 9th snow, followed with some rain and wind, which soon took off much snow. The remainder of the month was fairly moderate, taking off the snow gradually; and on the 22nd a heavy warm rain with wind took off most of what remained, and broke up sleighing. The weather continued open, and another rain followed on the 28th.

April opened fine with no very cold weather. It rained on the 5th, and again on the 11th, after which fine dry weather continued. On the 19th some seeding was done, but it set in wet on the 22nd, the weather being broken until the 26th; the balance of the month being fine.

May commenced fine with cold weather on the 2nd, when the last spring frost was recorded of 6°. The 4th was wet, and it continued dull until the 8th, when fine weather was broken by a rain on the 13th. It continued fine again until the 23rd, after which the month was broken and dull. No very great amount of rain fell during this month. but enough to retard seeding operations very much, and while the spring was early, yet the majority of the crops were late sown on account of the continuous dull weather.

June opened dull, but there was very fair weather the greater part of the month, with slight rains on the 2nd, 10th, 13th and 24th. The thermometer registered 81°, 83° and 80° on the 26th, 27th and 29th respectively.

July was exceptionally fine and dry, having only slight showers on the 8th and 15th. The mercury was up to 81°, 80°, 81°, 86°, 85°, 82°, 80° and 82° as the highest on the 12th, 13th, 14th, 15th, 16th, 18th, 22nd and 23rd respectively.

August was fine, with the exception of dull weather and light showers on the 6th, 9th and 10th. The temperature was up to 83°, 80°, 84°, 81°, 80° and 81° on the 1st, 6th, 7th, 24th, 28th and 30th respectively. The summer months were more continuously warm than usual, with no very extreme heat. The dry weather continued through August, affecting the crops very much.

September commenced fine, but dull weather and occasional showers continued after the first week until the 19th, when the first heavy rain of the season fell. This materially helped the crops still growing. The weather continued broken for three days, after which the month was fine. A temperature of 83° and 85° is recorded for the 6th and 7th respectively. This month throughout was unusually warm.

October commenced fine, but broken weather on the 3rd was followed by fine weather until the 18th and 19th, when it was again wet until the 26th. The remainder of the month was fine. The first frost of the season to strike here was on the 8th October, the thermometer registering then 1°, and on the 22nd 10° of frost is recorded. The weather was then moderate until the 28th, when the mercury again fell below freezing.

The first of November was fine, with snow and some rain on the 10th. It kept fine, with occasional frosts until the 25th, when we had a heavy rain and wind storm, followed by cold weather.

METEOROLOGICAL RECORD.

Maximum and minimum thermometrical observations for the year beginning with December 1, 1900, and ending November 30, 1901.

Month.	Maximum.	Minimum.
December, 1900	31st 39° above zero	18th 11° below zero.
January, 1901	23rd and 26th 39° above zero	23rd 10° "
February "	26th 36° above zero	23rd 3° "
March "	26th 45° "	7th 10° "
April "	19th and 28th 64° above zero	3rd 23° above zero.
May "	22nd 75° above zero	2nd 26° "
June "	27th 83° "	16th 35° "
July "	15th 86° "	25th 39° "
August "	7th 84° "	22nd 40° "
September "	7th 85° "	20th 33° "
October "	13th 68° "	22nd and 29th 22° above zero.
November "	1st 62° "	24th 9° above zero.

EXPERIMENTS WITH OATS.

Sixty-four varieties of oats were sown in uniform plots of one-fortieth acre each on May 1. The soil was a clay loam, and was previously in mangels, having been manured for that crop with 30 one-horse cart loads of manure per acre, which was put on in the spring of 1900, and to which 200 pounds of complete fertilizer was added before the rows were run up for the crop. The land was ploughed after the mangel crop was removed in the fall of 1900, and this spring was worked up by going over it twice with the spring-tooth harrow and once with the smoothing harrow. No fertilizer of any kind was used for the grain crop.

The seed was sown at the rate of 2½ bushels per acre with the Wisner seed drill. The field was seeded down to clover and timothy at the rate of 3 pounds of alsike, 7 pounds mammoth red clover and 12 pounds timothy seed per acre. This seed was sown with an attachment to the seeder at the same time the grain was sown. The crop of straw was generally good, and stood up well. It was bright and free from rust. The majority of the plots had some smutty heads in them, but none were badly affected. The results obtained from this test are given in the following table :—

OATS—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Cream Egyptian	Aug. 16	107	45	Stiff	7 to 9	Sided	5,200	76	16	40
Cromwell	" 22	113	48	"	6 " 9	"	6,000	74	4	36
Rosedale	" 10	101	46	"	6 " 9	"	5,000	71	26	40
Abyssinia	" 17	108	47	"	6 " 9	"	5,480	68	8	40
American Beauty	" 18	109	45	"	6 " 8	Branching	4,800	68	8	37
Oderbruch	" 16	107	46	Medium	6 " 8	Sided	5,000	68	8	38
White Schonen	" 15	106	44	Stiff	6 " 8	Branching	5,000	68	8	34
Early Golden Prolific	" 10	101	46	"	7 " 9	"	4,400	67	2	35
Flying Scotchman	" 10	101	46	Medium	6 " 9	"	5,000	67	2	40
Black Mesdag	" 6	97	45	Stiff	6 " 8	"	4,600	65	30	34
Black Beauty	" 9	100	44	"	7 " 10	"	5,000	65	30	34
Siberian	" 18	109	44	"	6 " 8	"	4,200	65	30	35
Improved American	" 18	109	48	"	7 " 9	"	4,800	65	30	36
Bavarian	" 18	109	46	"	7 " 9	"	5,030	65	30	37
Lincoln	" 18	109	45	"	6 " 8	"	4,800	64	24	37
Pense	" 16	107	45	"	7 " 9	Sided	4,800	64	24	37
Hazlett's Seizure	" 10	101	46	"	6 " 9	Branching	4,600	63	18	39
Prolific Black Tartarian	" 18	109	46	"	6 " 9	Sided	5,400	63	18	35
Mennonite	" 18	108	45	"	6 " 8	Branching	4,400	63	18	34
White Giant	" 16	107	44	"	6 " 8	"	4,280	63	18	36
Newmarket	" 18	109	45	Medium	7 " 9	"	5,000	63	18	36

OATS—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Banner	Aug. 16..	107	43	Stiff......	6 to 8	Branching..	5,000	63	18	36
Early Blossom	" 16..	107	46	"	6 " 8	Sided.......	5,000	62	12	40
White Russian	" 14..	105	44	Medium.	7 " 9	Branching..	4,600	62	12	37
Abundance	" 16..	107	43	Stiff	7 " 9	" ..	4,600	62	12	35
Joanette	" 10..	101	43	Medium..	6 " 9	" ..	4,500	62	12	35
Buckbee's Illinois	" 18..	109	46	Stiff. ...	6 " 8	" ..	5,000	62	12	37
Early Maine	" 17..	108	45	"	6 " 8	" ..	4,680	62	12	36
Bonanza	" 10.	101	46	"	7 " 10	" ..	4,500	61	6	36½
Wallis	" 18..	109	43	"	6 " 8	" ..	4,280	61	6	37
Kendal	" 16..	107	46	"	7 " 9	Sided.......	5,000	61	6	36
Early Archangel	" 8..	99	45	"	7 " 9	Branching..	4,200	60	..	40
Improved Ligowo	" 15..	106	45	"	6 " 8	" ..	4,600	60	..	38
Thousand Dollar	" 16..	107	46	"	6 " 8	" ..	4,600	60	..	38
Golden Beauty	" 18..	109	45	Medium..	6 " 8	" ..	4,200	60	..	36
Milford	" 16..	107	46	Stiff. .. .	6 " 9	Sided.......	4,400	60	..	39
Tartar King	" 10..	101	46	"	7 " 9	"	5,000	60	..	37
Golden Tartarian	" 22..	113	45	"	7 " 10	"	4,800	60	..	35
Sensation	" 11..	102	44	"	6 " 9	Branching..	3,800	58	28	36
Early Gothland	" 16..	107	46	"	7 " 9	Sided.......	4,200	58	28	38
California Prolific Black	" 18..	109	47	"	6 " 9	"	5,000	58	28	35
Scotch Potato	" 16..	107	40	"	6 " 8	Branching..	4,200	58	28	38½
Olive	" 16..	107	43	"	7 " 9	Sided.......	4,800	58	28	36
American Triumph	" 22..	113	46	"	6 " 9	Branching..	6,000	58	28	39
Golden Giant	" 22..	113	45	"	6 " 8	Sided.......	5,000	57	22	37
Irish Victor	" 15..	106	42	"	7 " 9	Branching..	4,400	57	22	34
Danish Island	" 18..	109	45	"	6 " 8	" ..	4,600	57	22	36
Holstein Prolific	" 15..	106	46	Medium..	6 " 9	" ..	4,200	57	22	37
Pioneer	" 18..	109	44	" ..	6 " 8	" ..	4,200	57	22	38
Wide Awake	" 18..	109	44	Stiff......	6 " 8	" ..	4,200	56	16	38
Salzer's Big 4	" 14..	105	42	"	6 " 8	" ..	4,200	56	16	35
Miller	" 18..	109	43	"	6 " 8	" ..	4,600	56	16	38
Goldfinder	" 18..	109	42	"	6 " 8	Sided.	4,200	55	10	35
Columbus	" 18..	109	43	Medium..	6 " 8	Branching..	3,800	55	10	36
King	" 16..	107	46	Stiff	6 " 8	" ..	4,200	54	4	38
Oxford	" 18..	109	45	Medium..	6 " 8	" ..	4,400	51	26	40
Waverley	" 16..	107	44	Stiff......	6 " 9	" ..	4,280	51	26	38
New Zealand	" 22..	113	46	"	7 " 9	Sided.......	5,000	49	14	37
Brandon	" 18..	109	46	"	6 " 9	Half Sided..	3,800	48	8	38½
Holland	" 18..	109	42	Medium..	6 " 8	" ..	4,200	47	2	38
Master	" 18..	109	45	" ..	6 " 9	Branching..	4,200	47	2	38½
Russell	" 18..	109	46	Stiff	6 " 9	Half Sided .	4,200	47	2	38½
Longhoughton	" 18..	109	42	"	7 " 9	Branching..	3,800	44	24	39
Salines	" 17..	108	46	"	6 " 8	" ..	4,400	44	24	35

EXPERIMENTS WITH BARLEY.

The different varieties of barley were sown May 11. The soil was of a clay loam character, and was previously in corn. It was manured for this crop in the spring of 1900, with 30 one-horse cart loads of stable manure per acre. After the corn crop was removed in the fall of 1900, it was ploughed, and before seeding to grain this spring it was worked up by going over it twice with the springtooth and once with the smoothing harrows.

Thirty varieties of six-rowed and twenty-two varieties of two-rowed sorts were sown. The seed was sown with the Wisner seed drill at the rate of two bushels per acre. The land was also seeded down to timothy and clover at the rate of 3 pounds alsike, 7 pounds mammoth red clover, and 12 pounds timothy per acre. No fertilizers of any sort were used with this grain. The plots were one-fortieth acre each.

The majority of the plots had smut in them, but in every case the injury from this cause was slight. The straw was stiff, and stood up well. It was free from rust. The following results were obtained from these test plots :—

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
Common	August 5.	86	44	Medium	1½ to 2	5,880	64	8	48
Oderbruch	" 7.	88	43	"	1½ " 2½	5,400	61	32	49
Odessa	" 7.	88	44	Stiff	1½ " 2½	5,080	60	..	48
Baxter	" 7.	88	44	"	2 " 3	5,520	59	8	49
Mensury	" 7.	88	42	"	2 " 3	4,000	56	32	48
Claude	" 7.	88	46	"	2 " 2½	5,600	52	24	49
Hulless Black	" 5.	86	34	Medium	2	5,400	50	40	61
Yale	" 12.	93	44	"	2	4,800	50	40	47
Albert	" 5.	86	40	Stiff	2 " 3	4,600	50	..	49
Excelsior	" 5.	86	48	Medium	2 " 3	5,080	50	..	40
Success	" 5.	86	41	"	2 " 2½	4,600	49	8	40
Argyle	" 7.	88	43	Stiff	2 " 3	4,400	48	16	48
Champion	" 5.	86	46	Medium	2 " 3	4,400	47	24	37
Vanguard	" 8.	89	44	Stiff	2 " 2½	4,600	47	24	48
Nugent	" 8.	89	41	"	2 " 3	4,000	47	24	48
Hulless White	" 5.	86	36	Medium	2 " 2½	5,000	46	32	59
Petschora	" 7.	88	44	Stiff	2 " 2½	3,600	46	32	47
Empire	" 8.	89	45	Medium	2 " 2½	3,480	46	32	48
Rennie's Improved	" 6.	87	45	Stiff	1½ " 2	3,480	46	32	48
Garfield	" 7.	88	46	"	2 " 2½	4,600	45	40	49½
Brome	" 12.	93	43	Medium	2 " 3	4,000	45	..	48
Pioneer	" 7.	88	43	Stiff	1½ " 2½	4,400	44	8	49
Phoenix	" 7.	88	43	"	1½ " 2	4,400	42	44	49
Trooper	" 10.	91	40	"	2 " 2½	4,000	41	32	48
Royal	" 8.	89	40	"	2 " 2½	4,000	41	32	47
Summit	" 15.	96	43	"	2 " 2½	4,000	40	40	49
Surprise	" 15.	96	42	"	2 " 2½	4,000	40	..	48
Mansfield	" 12.	93	42	"	2 " 2½	3,600	40	..	46
Stella	" 15.	96	42	"	2 " 2½	3,400	38	16	49
Blue Long Head	" 8.	89	40	"	2 " 3	4,000	38	16	43

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.
Beaver	Aug. 10..	91	40	Medium	2 to 4	5,800	56	32	50
French Chevalier	" 14..	95	42	"	2 " 4	5,000	52	24	50
Bolton	" 10..	91	41	Stiff	2 " 3	4,800	45	..	50
Newton	" 15..	96	41	"	2 " 3	4,080	45	..	50
Standwell	" 15..	96	42	Medium	2 " 3	3,600	45	..	48
Canadian Thorpe	" 15..	96	42	Stiff	2 " 3	5,200	44	8	49
Prize Prolific	" 14..	95	36	"	2 " 3½	4,000	42	24	49
Kirby	" 8..	89	43	"	2 " 3	4,200	40	40	49
Leslie	" 15..	96	42	"	2 " 3	4,600	39	8	48
Sidney	" 15..	96	41	"	2 " 3	3,800	38	16	50
Danish Chevalier	" 15..	96	38	Medium	3 " 4	3,200	38	16	49
Nepean	" 15..	96	44	Stiff	2 " 3	4,600	37	24	49
Harvey	" 15..	96	42	"	2 " 3	4,400	36	32	49½
Gordon	" 14..	95	46	"	2 " 3	4,800	36	32	48
Invincible	" 14..	95	38	"	2 " 3	4,600	35	40	49
Logan	" 15..	96	46	"	2 " 3	3,880	35	40	49
Kinver Chevalier	" 15..	96	38	Medium	3 " 4	3,000	33	16	49
Clifford	" 14..	95	42	Stiff	2 " 3	3,200	33	16	50
Victor	" 15..	96	42	Medium	2 " 3	3,200	30	40	48
Dunham	" 15..	96	43	Stiff	2 " 3	3,800	30	40	48
Fulton	" 15..	96	42	"	2 " 3	3,000	30	..	47
Jarvis	" 14..	95	43	"	3 " 4	3,000	27	24	47

EXPERIMENTS WITH SPRING WHEAT.

The soil on which these experiments were conducted was a clay loam. The previous crop was mangels, and the land received for this crop, 30 one-horse cart loads of manure per acre put on in the spring of 1900, to which was added 200 pounds complete fertilizer per acre. The land was ploughed after the mangel crop was removed, and this spring it was worked up by going over it twice with the springtooth and once with the smoothing harrow.

At the time of seeding 3 pounds alsike, 7 pounds mammoth red clover, and 12 pounds timothy seed per acre was sown with the grain. The seed was sown with the Wisner seed drill, which carries an attachment through which the clover and timothy are sown at the same time. The wheat was sown on April 30, at the rate of 1¾ bushels per acre, and no fertilizer of any kind was used. The size of the plots was one-fortieth of an acre each. The straw was bright and practically free from rust. There was no smut whatever. The straw was stiff and none lodged. The grain filled out well considering the dry season. The results obtained from the seventy-one varieties under test are given in the following table:—

WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Roumanian	Aug. 21	113	46	Stiff	2 to 3	Bearded	5,000	40		61½
Weldon	" 21	113	59	"	2 " 3	Beardless	4,810	35	20	60½
Advance	" 17	109	48	"	2 " 3	Bearded	4,800	35	20	60½
Hastings	" 20	112	44	Medium	2 " 3	Beardless	3,600	34	40	60½
Beaudry	" 21	113	46	"	2 " 3	Bearded	4,200	34	40	60
Crown	" 20	112	52	Stiff	2 " 3	"	4,600	34	40	59
Hungarian	" 19	111	47	Medium	3 " 3½	"	4,400	34	..	60
Colorado	" 18	110	48	Stiff	2 " 3	"	4,200	34	..	61½
White Connell	" 21	113	46	"	2 " 3	Beardless	4,400	34	..	60
Norval	" 20	112	47	"	2 " 3	Bearded	4,600	34	..	61
Clyde	" 20	112	50	"	2 " 3	Beardless	4,480	34	..	59
Admiral	" 20	112	50	"	2 " 3	"	4,800	33	20	60
Preston	" 18	110	50	"	3 " 3½	Bearded	4,480	33	20	61
Vernon	" 18	110	46	"	2 " 3	"	3,800	33	20	61
Alpha	" 20	112	52	"	2 " 3	"	5,400	33	20	60
White Russian	" 21	113	50	"	2 " 3	Beardless	4,800	33	20	60
Red Fern	" 19	111	50	"	2 " 3	Bearded	4,800	32	40	60
Plumper	" 19	111	46	Medium	2 " 3	"	4,000	32	40	61
Japanese	" 20	112	46	Stiff	2 " 3	"	4,120	32	40	58
Blair	" 20	112	44	Medium	2 " 3	"	4,120	32	40	60
Mason	" 20	112	46	Stiff	2 " 3	Beardless	3,880	32	..	61
Herisson Bearded	" 19	111	44	Weak	1½ " 2	Bearded	3,800	32	..	60
Harold	" 19	111	45	Medium	2 " 3	"	3,400	30	40	60
Stanley	" 20	112	46	Stiff	2 " 3	Beardless	3,800	30	40	61
Chester	" 20	112	42	"	2 " 3	"	3,440	30	40	60
Rio Grande	" 19	111	50	"	2½ " 4	Bearded	3,720	30	40	60
Monarch	" 21	113	48	"	2 " 3	Beardless	4,280	30	40	60
Byron	" 21	113	42	"	2 " 3	"	4,000	30	..	61
Percy	" 19	111	50	"	2 " 3	"	4,000	30	..	60
Pringle's Champlain	" 18	110	47	Medium	2 " 3	Bearded	3,400	30	..	60
Laurel	" 21	113	48	Stiff	2 " 3½	Beardless	4,120	30	..	59
Campbell's White Chaff	" 18	110	48	"	2 " 3	"	4,800	30	..	61
Red Swedish	" 18	110	48	"	2 " 3½	Bearded	3,8 0	30	..	61
White Fife	" 21	113	48	"	2 " 3	Beardless	4,200	30	..	60
Minnesota No. 163	" 21	113	46	"	2 " 3	Beardless	4,680	30	..	60
" No. 181	" 21	113	47	"	2 " 3	"	4,800	29	20	60
Wellman's Fife	" 21	113	50	"	2 " 3½	"	4,360	28	40	59
Blenheim	" 19	111	50	"	2 " 3½	Bearded	3,720	28	40	59

WHEAT—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Rideau	Aug. 20	112	46	Stiff	2 to 3	Beardless	4,400	28	40	59
Countess	" 21	113	47	"	2 " 3	"	3,600	28	40	60
Speltz	" 21	113	36	Weak	2 " 2¼	Bearded	2,800	28	..	41
Red Fife	" 19	111	47	Stiff	2 " 3	Beardless	3,400	27	20	60
Australian No. 10	" 26	118	46	"	2 " 3	"	4,680	27	20	59½
Early Riga	" 15	107	42	"	2 " 3	"	3,200	26	40	60
Ladoga	" 16	108	45	"	2 " 3	Bearded	3,800	26	40	60½
Crawford	" 20	112	45	"	2 " 3	Beardless	3,600	26	40	60
Ebert	" 20	112	45	"	2 " 3	"	3,600	26	40	60
Fraser	" 19	111	46	"	2 " 3	Bearded	3,400	26	40	59
Dion's	" 19	111	48	"	2 " 3	"	3,400	26	40	61
Australian No. 25	" 26	118	46	"	2 " 3	Beardless	3,580	26	40	59
Dawn	" 19	111	47	"	2 " 3	"	3,400	26	40	60
Bishop	" 21	113	46	"	2 " 3	"	3,400	26	..	61
Cassel	" 21	113	45	"	2 " 2½	"	3,320	26	..	59½
Goose	" 20	112	47	Medium	2 " 2½	Bearded	3,500	26	..	61½
Progress	" 20	112	47	Stiff	2 " 3	Beardless	3,400	25	20	60
Huron	" 19	111	48	"	2 " 2½	Bearded	3,800	25	20	60
Dufferin	" 19	111	46	"	2 " 3	"	3,400	24	40	60
Angus	" 20	112	48	"	2 " 3	Beardless	3,400	24	40	60
Cartier	" 20	112	42	"	2 " 2½	Bearded	2,800	24	40	59½
Beauty	" 19	111	48	Medium	2 " 2½	Beardless	2,920	24	40	59
Essex	" 21	113	46	Stiff	2 " 3½	"	2,580	24	40	58½
Australian No. 27	" 26	118	46	"	2 " 3	"	3,200	24	40	59
" No. 13	" 26	118	46	"	2 " 3	"	3,400	24	..	59½
Captor	" 21	113	38	"	2 " 2½	"	3,400	23	20	59
Minnesota No. 169	" 21	113	46	"	2 " 3	"	3,400	22	40	59
Australian No. 23	" 26	118	46	"	2 " 3	"	3,000	22	40	59½
Minnesota No. 149	" 21	113	44	"	2 " 3	"	3,400	22	..	59
Robin's Rust Proof	" 21	113	46	"	2 " 3½	"	4,400	20	40	60
Australian No. 9	" 26	118	44	"	2 " 3	"	3,400	20	..	59
" No. 19	" 26	118	45	"	2 " 3	"	3,080	20	..	59½
Benton	" 21	113	45	"	2 " 3	"	2,920	20	..	58½

EXPERIMENTS WITH PEASE.

Fifty-seven varieties of pease were sown on one-fortieth acre plots on May 2. The previous crop grown on this land was turnips, which received 18 one-horse cart loads of stable manure, and 200 pounds complete fertilizer per acre. The land was ploughed after the turnip crop was taken off, and this spring was worked up by going over it twice with the springtooth and once with the smoothing harrow.

The soil was a clay loam. No fertilizer was used for this crop. Timothy and clover seed at the rate of 3 pounds alsike, 7 pounds mammoth red clover ,and 12 pounds timothy per acre was sown with the grain.

The pea aphis was not troublesome this season, and has apparently disappeared. The results obtained from these tests are as follows:—

PEASE—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	Lbs.	In.		Bush.	Lbs.	Lbs.
Arthur	Aug. 22..	112	Strong....	48	5,400	2 to 2½	Medium....	50	..	62
Pearl	" 31..	121	"	36	5,200	2 " 2½	"	50	..	61
Gregory	" 28..	118	"	50	5,600	2 " 3	"	48	40	61½
Victoria	" 29..	119	"	48	5,600	2 " 3	Large	48	40	60
Pride	" 28..	118	"	50	5,400	2 " 3	Medium....	46	40	61
Elder	" 31..	121	"	45	5,400	2 " 3	"	46	40	61
Bright	" 28..	118	"	48	5,200	2 " 3	Large	46	40	62
Chancellor	" 17..	107	"	48	5,000	1½ " 2	Small	45	20	62
Fergus	" 31..	121	"	46	5,600	2 " 3	Medium....	45	20	62
Elliot	" 28..	118	"	48	5,600	1½ " 2	"	44	40	60
Agnes	" 28..	118	"	50	5,480	2 " 3	"	44	40	62
Crown	" 25..	115	"	43	4,000	1 " 2	Small	44	..	62
Paragon	" 18..	108	Weak ..	30	3,600	1 " 2	Medium....	43	20	62
Oddfellow	" 28..	118	Strong....	46	4,600	1 " 2	"	43	20	62
Large White Marrowfat	" 28..	118	"	53	4,800	3 " 3½	Large	43	20	62½
Prince Albert	" 27..	117	" ...	46	5,200	2 " 3	Medium....	43	20	61
Multiplier	" 28..	118	"	48	5,600	2 " 3	"	43	20	62
Herald	" 30..	120	"	48	5,000	2 " 2¼	"	42	40	62
Bruce	" 28..	118	"	48	5,400	2 " 3	Large	42	40	61½
Duke	" 23..	113	"	50	5,000	1½ " 2	Medium....	42	40	61
Dover	" 29..	119	"	50	5,000	2 " 3	Large	42	40	63
Kent	" 31..	121	"	50	4,400	2 " 3	"	42	40	61
Wisconsin Blue	" 28..	118	"	44	4,200	2 " 3	Medium....	42	40	62
Macoun	" 28..	118	"	48	4,000	2 " 3	"	42	40	63
Nelson	" 18..	108	"	46	4,400	2 " 3	"	42	40	63
Archer	" 23..	113	"	50	4,400	2 " 2½	"	42	..	63
Picton	" 29..	119	"	46	4,800	2 " 3	"	42	..	62
Mackay	" 29..	119	" ...	48	5,000	2 " 3½	Large	42	..	61
Chelsea	" 31..	121	"	48	5,600	2 " 3	"	42	..	61
New Potter	" 27..	117	"	50	5,600	2 " 3	"	42	..	61½
White Wonder	" 17..	107	"	35	4,000	2 " 3	Medium....	41	20	62
Cooper	" 23..	113	"	48	4,600	2 " 2½	"	41	20	63
King	" 23..	113	"	48	4,200	2 " 3	"	41	20	61½
Prussian Blue	" 18..	108	" ...	46	5,000	2 " 2½	"	40	40	63
French Canner	" 28..	118	"	48	5,000	2½ " 3	"	40	40	62
Early Britain	" 17..	107	"	50	4,600	1½ " 2	Large	40	40	61
Perth	" 21..	111	"	48	4,200	2 " 2½	"	40	40	62
Elephant Blue	" 18..	108	"	50	4,800	2 " 3	Medium....	40	40	62
Golden Vine	" 23..	113	" ...	46	3,800	1 " 2	Small	40	40	62½
German White	" 23..	113	"	52	4,400	2 " 2½	Medium....	40	40	63
Lanark	" 29..	119	"	54	4,400	2 " 3	Large	40	40	61
Creeper	" 17..	107	"	50	4,200	2 " 2½	Small	38	40	63
Daniel O'Rourke	" 25 .	115	"	48	3,720	2 " 2½	Medium....	38	40	63
Prince	" 18..	108	"	43	4,200	1½ " 2	"	38	40	62
Harrison's Glory	" 18..	108	"	41	3,800	2 " 3	"	38	..	62½
Black-eyed Marrowfat	" 27..	117	"	50	4,600	2 " 3	Large	38	..	62
Trilby	" 29..	119	"	49	4,600	2 " 3	"	37	20	61½
Mummy	" 27..	117	"	50	4,580	2 " 3	Medium....	36	40	62½
Alma	" 18..	108	"	48	4,200	2 " 2½	"	36	40	62
Carleton	" 28..	118	" ...	40	3,600	1½ " 2	Small	36	40	62½
Fenton	" 28..	118	"	42	4,000	2 " 2½	Medium....	36	40	61
English Grey	" 30..	120	"	50	4,200	2 " 3	"	36	40	61
Centennial	" 23..	113	" .. .	51	3,800	2 " 2½	"	35	20	63
Vincent	" 29..	119	"	46	3,880	2 " 3	"	35	20	61
Canadian Beauty	" 22..	112	"	50	4,600	2 " 3	Large	33	20	62
Bedford	" 28..	118	"	48	3,400	2 " 3	Medium....	25	20	63
Grass Pea	" 31..	121	Small	36	3,800	1 " 2	Small	22	..	63

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were under test. These plots were one-fortieth acre each. The land was a clay loam in a very poor state of fertility. The previous crops were grown without stable manure. The land was ploughed in the spring, and worked up twice with the springtooth and once with the smoothing harrow. The seed was sown June 6 with the Wisner seed drill and complete fertilizer at the rate of 100 pounds per acre was drilled in with the seed. The crop was harvested August 30. The warm dry weather seemed to cause this crop to shrink very much, much of the seed not being filled. The following yields per acre were obtained:—

BUCKWHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				Inches.		Lbs.	Bush.	Lbs.	Lbs.
Silver-hull	June 6th	Aug. 30	86	36	Stiff.	4,000	16	40	50
Tartarian, or Siberian	"	"	86	37	"	2,280	14	..	48
Grey	"	"	86	35	"	3,400	13	20	48
Rye Buckwheat	"	"	86	39	"	2,600	13	20	49
Japanese	"	"	86	36	"	2,920	12	..	45

EXPERIMENTS WITH FIELD GRAIN.

Six plots of grain of one-half acre each were grown to further test the value of different varieties in field trials. Five of these plots were sown with different sorts of oats, and one with mixed grain made up as follows:—Oats, 2 bushels; barley, 1 bushel; pease, 1 peck, mixed and sown at the rate of 3 bushels per acre.

The land was a light loam, having corn as a previous crop. It was manured for the corn crop in the spring of 1900, with 25 one-horse cart loads of stable manure per acre, and after the corn crop was removed the land was ploughed. This was worked up in the spring time with the springtooth and once with the smoothing harrow. The seed was sown May 10, at the rate of 3 bushels per acre. It was harvested August 14. The following yields were obtained:—

Varieties.	Yield per Acre.	
	Bush.	Lbs.
Rosedale	54	10
White Schonen	49	10
Cream Egyptian	49	4
Black Tartarian	43	28
Sensation	42	12
Mixed Grain	51	31

FIELD CROP OF OATS ON MARSH.

Twelve acres of marsh were ploughed in the fall of 1900. It was worked up in the spring by going over it twice with the spade harrow; twice with the springtooth, and

once with the smoothing harrow. The seed was sown broadcast by hand at the rate of 3½ bushels per acre. The grain was sown and harrowed in with the springtooth harrow, after which clover and timothy, at the rate of 3 pounds alsike, 7 pounds mammoth red clover, and 12 pounds timothy seed per acre were sown and worked up by going over it once with the smoothing harrow. No fertilizer of any kind was used. Eight acres of this were sown May 20, and yielded at the rate of 35 bushels per acre.

Another four acres were low, wet marsh, which made it difficult to work, and seeding was not done on it until June 5. The land was worked in a manner similar to the other marsh and seeded at the same rate. The yield from this was at the rate of 20 bushels per acre.

Owing to the dry season the straw was very short, and the yield very light. That grown on the low, wet land was also badly injured with rust.

FIELD CROPS OF MIXED GRAIN ON UPLAND.

The grain used in this field was made up as follows:—Oats, 2 bushels; barley, 1 bushel; pease, 1 peck, mixed together and sown at the rate of three bushels per acre. The seed was sown May 11 and harvested August 17.

The soil was a light clay loam. The previous crop was turnips, and the land received for this crop, 18 one-horse cart loads of manure and 200 pounds complete fertilizer per acre. No fertilizer of any kind was used with the grain crop. The yield per acre was 50 bushels.

FIELD CROP OF BUCKWHEAT.

Ten acres of buckwheat was grown on land which was in a poor state of fertility. The previous crop was buckwheat, seeded to clover. The clover made a very poor growth. The land was ploughed in the spring, and worked up with the disc, springtooth and smoothing harrows. It was seeded to silver-hull buckwheat, June 20, at the rate of 1 bushel per acre. Owing to the hot dry weather the crop blighted, and did not fill out well.

The yield from this field was 126 bushels.

Five acres of land, which was also in a poor state of fertility, having previously a crop of buckwheat, seeded down with clover, was sown June 20 to silver-hull buckwheat at the rate of 1 bushel per acre, and Albert Thomas Phosphate at the rate of 200 pounds per acre was sown with the seed by means of the fertilizer attachment on the seeder. The yield from this field was 84 bushels. This field did not blight nearly so badly as the 10 acres, due possibly to being later sown, and the blossoming period escaping the hot weather.

EXPERIMENTS WITH INDIAN CORN.

The soil on which the corn plots were laid out was a clay loam. The previous crop was timothy. The land was manured in the fall of 1900 on the sod, with 20 one-horse cart loads of barn-yard manure per acre. This manure together with a good crop of grass was ploughed under June 1, 1901. The land was worked with the disc harrow once, and once with the smoothing harrow. Marks were made 3 feet apart, and the seed dropped in the rows, after which it was covered with the hoe by hand. Duplicate plots were also sown in hills 3 feet apart.

The seed was sown June 3, and the crop was harvested September 27. No chemical fertilizers were used on these plots. The yield per acre is estimated from the crop obtained from two rows, each 66 feet long. Thirty-four varieties were included in the test, and the following results were obtained:—

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Height.	Leafiness.	When Tasseled	In Silk.	Condition when cut, Sept. 27.	Weight per acre grown in rows.		Weight per acre grown in hills.	
	In.					Tons.	lbs.	Tons.	lbs.
Early Mastodon	83	Medium..	Aug. 25	Sept. 1	Milk..... ..	20	150	19	500
Cloud's Early Yellow	84	" ..	" 28	" 5	Watery.....	19	1,600	17	100
Mammoth Cuban	98	" ..	" 31	" 10	Silk........	17	650	17	650
Champion White Pearl	84	" ..	" 22	" 3	Late milk ..	17	320	14	1,150
Selected Leaming	84	" ..	" 22	" 3	" ..	17	100	14	1,700
Early Butler	73	" ..	" 22	" 3	" ..	16	1,220	14	1,700
Early Yellow Long Eared	66	" ..	" 19	Aug. 30	Soft glazed..	16	1,000	15	800
Pride of the North	92	" .	" 25	Sept. 1	Milk........	15	1,900	17	650
Longfellow	75	Very.. ..	" 17	Aug. 28	Soft glazed..	15	250	12	1,520
Red Cob Ensilage	100	Medium..	Sept. 20	" 28	Tasseled	14	1,700	14	1,700
Rural Thoroughbred White Flint	86	" ..	" 20	Sept. 25	Silk........	14	1,700	15	250
Giant Prolific Ensilage	90	" ..	" 28	" 10	Early milk..	14	1,370	15	1,570
Extra Early Huron Dent	96	" ..	" 22	" 3	" ..	14	1,370	11	1,650
Angel of Midnight	73	Very.....	" 17	Aug. 28	Soft glazed..	14	1,370	11	1,650
Sanford	74	"	" 19	Sept. 1	Late milk ..	14	270	13	950
King of the Earliest	72	Medium..	" 19	" 15	Watery.....	14	50	13	1,500
Salzer's All Gold	72	" ..	" 23	" 15	Late milk ..	14	50	14	1,700
Compton's Early	75	Very.....	" 15	Aug. 26	Soft glazed..	14	50	13	950
Ruby Mexican	85	"	" 26	Sept. 7	Milk........	13	1,720	13	400
Evergreen Sugar	78	Medium..	" 25	" 7	"	13	1,500	13	1,500
North Dakota Yellow	72	Very.....	" 17	Aug. 25	Glazed	13	950	14	1,600
Kendall's Early Giant	86	Medium .	Aug. 15	" 30	Soft glazed..	13	950	14	600
Salzer's Superior Fodder	84	"	" 15	" 30	Silk	13	620	15	250
Mammoth Eight-rowed Flint	90	"	" 19	Sept. 1	Early milk..	13	620	15	250
White Cap Yellow Dent	98	"	" 20	" 1	" ..	13	400	15	1,900
Canada White Flint	72	"	" 19	Aug. 30	Soft glazed..	13	400	14	600
Country Gentleman	75	Very.....	" 19	" 30	" ..	12	1,850	13	400
North Dakota White	73	Medium..	" 19	" 30	Early milk..	12	750	11	1,650
Pearce's Prolific	72	Very.....	" 17	" 26	Glazed	12	750	11	1,650
Salzer's Earliest Ripe	56	"	" 17	" 26	"	10	900	10	900
Yellow Six Weeks	60	"	" 1	" 15	Hard glazed	10	550	9	1,800
Early August	60	"	" 1	" 15	" ..	9	1,800	9	150
Mitchell's Extra Early	60	"	" 1	" 15	" ..	9	370	8	500
Extra Early Szekely	60	"	" 1	" 15	" ..	8	1,600	9	150

CORN SOWN IN ROWS AT DIFFERENT DISTANCES.

Similar experiments to those conducted last year were made with Indian corn to gain information as to the distances apart the rows should be planted to give the largest yield per acre. Champion White Pearl, Longfellow and Selected Leaming were the varieties used.

The land on which this corn was planted was a clay loam in a good state of fertility. The previous crop was clover, the aftermath of which was ploughed under in the fall of 1900. This ground was disc-harrowed in the spring, and stable manure at the rate of 20 one-horse cart loads per acre was spread broadcast and ploughed under. The ground was worked up with the disc, springtooth and smoothing harrows, after which the seed was sown with the seed drill in rows 21, 28, 35 and 42 inches apart. The seed was sown June 8, and the crop harvested October 1. The plots were one-fortieth acre each, and from the crop obtained from these plots the following yields per acre have been calculated.

CORN AT DIFFERENT DISTANCES APART.

Name of Variety.	Distances between rows.	Yield per acre.	
	Inches.	Tons	lbs.
Selected Leaming	21	22	1,450
"	28	24	1,000
"	35	21	625
"	42	18	225
Longfellow	21	18	900
"	28	20	600
"	35	18	575
"	42	18	900
Champion White Pearl	21	18	....
"	28	21	1,750
"	35	18	1,510
"	42	18	1,125

It will be seen that in each of these trials, the corn planted 28 inches apart gave the heaviest crop.

EXPERIMENTS WITH TURNIPS.

The soil of these plots was a clay loam in a good state of fertility. The previous crop was clover, the aftermath of which was ploughed under in the fall of 1900. In the spring this was worked up with the spade harrow, and 20 one-horse cart loads of stable manure per acre was spread broadcast and ploughed under. This was then gone over with the springtooth and once with the disc harrow, and once with the smoothing harrow. Two hundred pounds of complete fertilizer per acre was sown broadcast and harrowed in with the smoothing harrow. The land was then run up into drills 24 inches apart. The rows were raked off by hand, and marks made along the top of the rows into which the seed was dropped and lightly covered.

The first series of plots was sown May 27, and duplicate ones two weeks later, June 10. The roots were all pulled October 30, and the following yields per acre were calculated from two rows, each 66 feet long. Twenty-nine varieties were included in this test. The turnip plots were somewhat infested with the turnip aphis (*Aphis brassicae*) toward the latter part of the season.

TURNIPS—TEST OF VARIETIES.

Name of Variety.	1st plot sown.	2nd plot sown.	1st plot pulled.	2nd plot pulled.	Yield per acre. 1st plot.		Yield per acre. 1st plot.		Yield per acre. 2nd plot.		Yield per acre. 2nd plot.	
					Tons	lbs.	Bush.	lbs.	Tons	lbs.	Bush.	lbs.
Hartley's Bronze	May 27.	June 10.	Oct. 30.	Oct. 30.	44	1,100	1,485	..	28	925	948	45
Carter's Elephant	" 27.	" 10.	" 30.	" 30.	42	150	1,402	30	23	200	770	..
New Arctic	" 27.	" 10.	" 30.	" 30.	41	500	1,375	..	32	350	1,072	30
Imperial Swede	" 27.	" 10.	" 30.	" 30.	40	850	1,347	30	25	325	838	45
Perfection Swede	" 27.	" 10.	" 30.	" 30.	37	1,900	1,265	..	30	1,875	1.031	15
Mammoth Clyde	" 27.	" 10.	" 30.	" 30.	37	1,075	1,251	15	24	1,500	825	..
Jumbo	" 27.	" 10.	" 30.	" 30.	37	250	1,237	30	26	800	880	..
Selected Champion	" 27.	" 10.	" 30.	" 30.	36	1,425	1,223	45	30	225	1,003	45
Bangholm Selected	" 27.	" 10.	" 30.	" 30.	35	950	1,183	30	24	1,500	825	..
Giant King	" 27.	" 10.	" 30.	" 30.	35	950	1,183	30	22	550	742	30
Prize Purple Top	" 27.	" 10.	" 30.	" 30.	34	475	1,141	15	28	1,750	962	30
Selected Purple Top	" 27.	" 10.	" 30.	" 30.	34	475	1,141	15	24	1,500	825	30
Halewood's Bronze Top	" 27.	" 10.	" 30.	" 30.	33	1,650	1,127	30	26	800	880	..
Kangaroo	" 27.	" 10.	" 30.	" 30.	33	1,650	1,127	30	24	1,500	825	..
Marquis of Lorne	" 27.	" 10.	" 30.	" 30.	33	1,650	1,127	30	25	1,975	866	15
Monarch	" 27.	" 10.	" 30.	" 30.	33	1,650	1,127	30	24	675	811	15
Shamrock Purple Top	" 27.	" 10.	" 30.	" 50.	33	1,650	1,127	30	28	1,758	962	30
Webb's New Renown	" 27.	" 10.	" 30.	" 30.	33	....	1,100	..	26	1,625	893	45
Hall's Westbury	" 27.	" 10.	" 30.	" 30.	31	1,525	1,058	45	25	1,150	852	30
East Lothian	" 27.	" 10.	" 30.	" 30.	31	700	1,045	..	22	1,375	756	15
Emperor Swede	" 27.	" 10.	" 30.	" 30.	31	700	1,045	..	29	1,400	990	..
West Norfolk Red Top	" 27.	" 10.	" 30.	" 30.	30	1,875	1,031	15	29	1,400	990	..
Elephant's Master	" 27.	" 10.	" 30.	" 30.	30	1,875	1,031	15	20	1,250	687	30
Skirvings	" 27.	" 10.	" 30.	" 30.	30	225	1,003	45	22	1,375	756	15
Drummond Purple Top	" 27.	" 10.	" 30.	" 30.	29	1,400	990	..	26	1,625	893	45
Champion Purple Top	" 27.	" 10.	" 30.	" 30.	28	1,750	962	30	18	1,125	618	45
Magnum Bonum	" 27.	" 10.	" 30.	" 30.	28	1,750	962	30	19	1,600	660	..
Sutton's Champion	" 27.	" 10.	" 30.	" 30.	28	1,750	962	30	21	75	701	15
Prize Winner	" 27.	" 10.	" 30.	" 30.	28	700	935	..	20	1,250	687	30

EXPERIMENTS WITH MANGELS.

Twenty-five varieties of mangels were sown May 27, and duplicate plots two weeks later, June 10. The land on which these were grown was previously in clover, the aftermath of which was ploughed under in the fall of 1900. This land was a clay loam and was in a good state of fertility. Twenty one-horse cart loads of stable manure was applied broadcast this spring, after the ground had been gone over once with the disc harrow. The manure was then ploughed under, and after the springtooth harrow had gone over it the disc was again used. The smoothing harrow was also run over it, after which complete fertilizer at the rate of 200 pounds per acre was sown broadcast, and worked in with the smoothing harrow. The land was then run into drills 24 inches apart. The rows were raked off and the seed sown in holes one foot apart, made with a marker, and from three to six seeds dropped in a place. These were covered by hand with a garden rake.

The plants came up very irregularly, particularly this was the case with the first sown plots. This may have been the fault of the seed to some extent, but more likely on account of the cold wet weather, which continued for some time after they were sown.

The roots from both series of plots were pulled October 30, and the following yield per acre was calculated from two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Name of Variety.	1st plot sown.	2nd plot sown.	1st plot pulled.	2nd plot pulled.	Yield per acre. 1st plot.	Yield per acre. 1st plot.	Yield per acre. 2nd plot.	Yield per acre. 2nd plot.
					Tons lbs.	Bush. lbs.	Tons lbs.	Bush. lbs.
Gate Post	May 27.	June 10.	Oct. 17.	Oct. 17.	39 1,200	1,320 ..	32 1,175	1,086 15
Golden Fleshed Tankard	" 27.	" 10.	" 17.	" 17.	37 1,075	1,251 15	28 100	935 ..
Half Long Sugar Rosy	" 27.	" 10.	" 17.	" 17.	35 1,775	1,196 15	30 225	1,003 45
Giant Yellow Globe	" 27.	" 10.	" 17.	" 17.	35 620	1,177 ..	33 ..	1,100 ..
Half Long Sugar White	" 27.	" 10.	" 17.	" 17.	35 125	1,168 45	31 700	1,045 ..
Warden Orange Globe	" 27.	" 10.	" 17.	" 17.	34 1,795	1,163 15	31 205	1,036 45
Canadian Giant	" 27.	" 10.	" 17.	" 17.	34 1,300	1,155 ..	31 700	1,045 ..
Red Fleshed Tankard	" 27.	" 10.	" 17.	" 17.	33 1,650	1,127 30	25 1,975	866 15
Mammoth Yellow Intermediate	" 27.	" 10.	" 17.	" 17.	33	1,100 ..	37 250	1,237 30
Champion Yellow Globe	" 27.	" 10.	" 17.	" 17.	32 1,340	1,089 ..	31 1,525	1,058 45
Norbiton Giant	" 27.	" 10.	" 17.	" 17.	32 350	1,072 30	32 1,175	1,086 15
Mammoth Oval Shaped	" 27.	" 10.	" 17.	" 17.	31 1,525	1,058 45	31 1,195	1,053 15
Ward's Large Oval Shaped	" 27.	" 10.	" 17.	" 17.	31 700	1,045 ..	35 125	1,168 45
Yellow Intermediate	" 27.	" 10.	" 17.	" 17.	30 1,875	1,031 15	31 700	1,045 ..
Lion Yellow Intermediate	" 27.	" 10.	" 17.	" 17.	29 1,895	998 15	33 825	1,113 45
Prize Mamm. Long Red	" 27.	" 10.	" 17.	" 17.	29 1,895	998 15	29 575	976 15
Leviathan Long Red	" 27.	" 10.	" 17.	" 17.	29 400	990 ..	30 1,875	1,031 15
Giant Yellow Half Long	" 27.	" 10.	" 17.	" 17.	29 400	990 ..	30 1,875	1,031 15
Gate Post Yellow	" 27.	" 10.	" 17.	" 17.	29 400	990 ..	31 205	1,036 45
Mammoth Long Red	" 27.	" 10.	" 17.	" 17.	28 1,750	962 30	28 925	948 45
Yellow Fleshed Tankard	" 27.	" 10.	" 17.	" 17.	28 1,750	962 30	36 1,755	1,229 15
Selected Mammoth Long Red	" 27.	" 10.	" 17.	" 17.	28 760	946 ..	28 100	935 ..
Giant Yellow Intermediate	" 27.	" 10.	" 17.	" 17.	27 1,440	924 ..	31 1,525	1,058 45
Prize Winner Yellow Globe	" 27.	" 10.	" 17.	" 17.	27 1,275	921 15	27 1,275	921 15
Triumph Yellow Globe	" 27.	" 10.	" 17.	" 17.	25 325	838 45	31 1,525	1,058 45

EXPERIMENTS WITH CARROTS.

The experiments with carrots were conducted on land which was clay loam in a good state of fertility. The land previously was in clover, the aftermath of which was ploughed under in the fall of 1900. Stable manure at the rate of 20 one-horse cart loads per acre was spread broadcast in the spring of 1901, after the ground had been once worked with the disc harrow. The manure was ploughed under, and the land harrowed once with the spring-tooth harrow. The disc harrow was again used, after which the smoothing harrow went over the ground. Complete fertilizer at the rate of 200 pounds per acre was sown broadcast, and harrowed in with the smoothing harrow. The land was then run into drills 24 inches apart.

The rows were raked off by hand, and marks made along the top of the rows into which the seed was sown and covered with the garden rake. Twenty varieties of carrots were grown, and the yield per acre was calculated from two rows, each 66 feet long. The seed was sown May 27, and duplicate plots were sown two weeks later, June 10. The crop was harvested October 30, and the following particulars obtained:—

CARROTS—TEST OF VARIETIES.

Name of Variety.	1st plot sown.	2nd plot sown.	1st plot pulled.	2nd plot pulled.	Yield per acre. 1st plot.		Yield per acre. 1st plot.		Yield per acre. 2nd plot.		Yield per acre. 2nd plot.	
					Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
Giant White Vosges......	May 27	June 10	Oct. 30	Oct. 30	31	700	1,045	..	21	900	715	..
Ontario Champion.......	"	"	"	"	30	1,050	1,017	30	21	1,725	728	45
Mammoth White Intermediate.....	"	"	"	"	29	1,400	990	..	17	1,475	591	15
White Belgian..... .. .	"	"	"	"	29	1,400	990	..	19	1,600	660	..
New White Intermediate.	"	"	"	"	28	100	935	..	21	900	715	..
Improved Short White ..	"	"	"	"	27	450	907	30	19	775	646	15
Green Top White Orthe..	"	"	"	"	26	1,295	888	15	21	900	715	..
Guerande or Ox-heart ...	"	"	"	"	26	800	880	..	17	650	577	30
Yellow Intermediate	"	"	"	"	24	1,500	825	..	20	1,250	687	30
Early Gem..............	"	"	"	"	24	1,005	816	45	16	1,825	563	45
Long Yellow Stump Rooted..............	"	"	"	"	24	675	811	15	19	775	646	15
Half Long Chantenay....	"	"	"	"	23	1,025	783	45	19	1,600	660	..
Iverson's Champion......	"	"	"	"	21	1,725	728	45	20	1,250	687	30
Half Long White.... ..	"	"	"	"	21	1,725	728	45	20	425	673	45
Long Scarlet Altringham.	"	"	"	"	20	425	673	45	18	525	608	45
Carter's Orange Giant....	"	"	"	"	19	775	646	15	18	525	608	45
Scarlet Intermediate.....	"	"	"	"	19	775	646	15	16	1,825	563	45
Scarlet Nantés	"	"	"	"	18	300	605	..	11	1,925	398	45
Long Orange or Surrey...	"	"	"	"	17	1,475	591	15	16	175	536	15
White Vosges, Large Short	"	"	"	"	17	1,475	591	15	14	1,700	495	..

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of sugar beets were sown May 27, and duplicate plots two weeks later, June 10. The yield per acre was calculated from the crop obtained from two rows, each 66 feet long. The crop was pulled October 17.

The soil was in a good state of fertility, and was previously in clover, the aftermath having been ploughed under in the fall of 1900. In the spring this was worked up with the disc harrow, and 20 one-horse cart loads of stable manure applied per acre. The land was then ploughed, and harrowed with the disc harrow. The smoothing harrow was next used, after which 200 pounds of complete fertilizer per acre was sown and worked in with the smoothing harrow. The rows were run 24 inches apart, and the seed sown in holes one foot apart, made with a marker and from 3 to 6 seeds dropped in a hole. This was covered with a garden rake. The yield per acre obtained was as follows:—

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	1st plot sown.	2nd plot sown.	1st plot pulled.	2nd plot pulled.	Yield per acre 1st plot.		Yield per acre, 1st plot.		Yield per acre, 2nd plot.		Yield per acre. 2nd plot.	
					Tons	lbs.	Bush.	lbs.	Tons	lbs.	Bush.	lbs.
Improved Imperial	May 27	June 10	Oct. 17	Oct. 17	33	..	1,100	..	28	1,750	962	30
Red Top Sugar........ ..	" 27	" 10	" 17	" 17	27	780	913	..	30	225	1,003	45
Danish Improved........	" 27	" 10	" 17	" 17	25	1,975	866	15	26	1,625	893	45
Royal Giant............	" 27	" 10	" 17	" 17	25	1,645	860	45	26	1,625	893	45
Wanzleben	" 27	" 10	" 17	" 17	25	655	844	15	21	900	715	..
Danish Red Top..... ...	" 27	" 10	" 17	" 17	25	325	838	15	28	1,750	962	30
Vilmorin's Improved.....	" 27	" 10	" 17	" 17	22	1,045	750	45	20	1,250	687	30

EXPERIMENTS WITH POTATOES.

The land on which the potatoes were grown was a clay loam. The previous crop was grain. The land was manured in the fall of 1900 with 30 one-horse cart loads of stable manure per acre, which was spread broadcast and ploughed under in the spring, this was worked up once more with the disc harrow and ploughed, after which it was gone over once each with the spring-tooth, disc and smoothing harrows, and drilled into rows 30 inches apart. No other fertilizers were used in these plots.

The seed was cut, leaving from two to three eyes in each piece, and planted one foot apart in the drills and covered with the plough.

Ninety-two varieties were planted May 17, and dug September 23 and 24. Owing to the dry weather an unusually large crop was not harvested, but they were entirely free from rot. They were sprayed with Bordeaux mixture and Paris green July 20 and August 20, and once with Paris green June 26. The yield per acre has been calculated from two rows, each 66 feet long.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Rose No. 9	418	..	385	..	33	..	Oblong and pink.
Irish Daisy	418	..	365	12	52	48	Round, white.
Canadian Beauty	404	48	360	48	44	..	Oblong, pink and white.
Sabean's Elephant	402	36	365	12	37	24	Oblong, white.
Early Fortune	396	..	369	36	26	24	Long, round, pink.
Late Puritan	385	..	363	..	22	..	Long, white.
Troy Seedling	374	..	301	24	72	36	Round, white.
Holborn Abundance	360	48	325	36	35	12	"
Rural No. 2	360	48	334	24	26	24	"
Seedling No. 7	356	24	330	..	26	24	Oval, pink.
Brown's Rot Proof	356	24	268	24	88	..	"
Clay Rose	352	..	319	..	33	..	Round, pink.
Swiss Snowflake	352	..	319	..	33	..	Round, white.
Cambridge Russet	352	..	312	24	39	36	"
Enormous	352	..	330	..	22	..	Oblong, white.
Rural Blush	349	48	312	24	37	24	Round, pink.
Seattle	345	24	308	..	37	24	Long, white.
Dreer's Standard	345	24	301	24	44	..	Round, white.
Bill Nye	341	..	301	24	39	36	"
Carman No. 3	341	..	323	24	17	36	"
Pride of the Market	341	..	308	..	33	..	Long, pink and white.
Penn. Manor	341	..	312	24	28	36	Long, pink.
Hale's Champion	336	36	281	36	55	..	Long, white.
Vick's Extra Early	336	36	308	..	28	36	Oval, white.
Rawdon Rose	336	36	281	36	55	..	Oblong, pink and white.
Houlton Rose	332	12	310	12	22	..	Long, pink.
Brownell's Winner	332	12	310	12	22	..	"
Beauty of Hebron	330	..	275	..	55	..	Round, pink and white.
Vanier	327	48	301	36	24	12	Long, pink.
Pearce's Prize Winner	323	24	299	12	24	12	Long, white.
Prolific Rose	319	..	268	24	50	36	Oblong, pink and white.
McIntyre	316	48	277	12	39	36	Round, white and blue.
White Beauty	316	48	281	36	35	12	Long, round, white.
Mortgage Lifter	316	48	250	48	66	..	Oblong, white.
Great Divide	312	24	290	24	22	..	Long, white.
Sir Walter Raleigh	310	12	286	..	24	12	Round, pink and white.
Seedling No. 230	308	..	250	48	57	12	Round, white.
Early St. George	303	36	255	12	48	24	Oblong, pink and white.
Quaker City	303	36	259	36	44	..	Round, white
Pearce's Extra Early	297	..	264	..	33	..	Long, pink.
Everett	294	48	237	36	57	12	Flattish, pink.
Money Maker	292	36	246	24	46	12	Long, pink and white.
Country Gentleman	292	36	275	..	17	36	"

POTATOES—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Prize Taker	290	24	235	24	55	..	Round, white.
Dakota Red	290	24	246	24	44	..	Round, red.
Irish Cobbler	290	24	253	..	37	24	Round, white.
Flemish Beauty	288	12	253	..	35	12	Long, flat, pink.
Columbus	288	12	259	36	28	36	Long, white.
Northern Spy	286	..	264	..	22	..	Round, red.
Maggie Murphy	286	..	264	..	22	..	Long, pink.
Delaware	279	24	244	24	33	..	Round, white.
Thorburn	277	12	248	36	28	36	Oblong, pink, white.
Calico	277	12	211	12	66	..	Long, pink and white.
General Gordon	275	..	246	24	28	36	Oblong, pink.
Ohio Junior	275	..	253	..	22	..	Round, pink.
Burnaby Seedling	272	48	261	48	11	..	Round, pink.
American Giant	272	48	244	12	28	36	Long, white.
Early Norther	272	48	250	48	22	..	Long, pink and white.
Uncle Sam	270	36	237	36	33	..	Oblong, white.
Maule's Thoroughbred	268	24	235	24	33	..	Oblong, white.
Green Mountain	266	12	233	12	33	..	Oval, white.
I. X. L	266	12	244	12	22	..	Long, pink and white.
New Queen	264	..	220	..	44	..	Oblong, pink.
Rochester Rose	264	..	233	12	30	48	Oblong, pink.
Early White Prize	259	36	242	0	17	36	Round, white.
Lizzie's Pride	259	36	226	36	33	..	Long, pink.
Early Harvest	257	24	224	24	33	..	Oval, pink and white.
Early Andes	255	12	198	..	57	12	Round, pink.
New Variety No. 1	253	..	220	..	33	..	Round, pink.
Carman No. 1	250	48	215	36	35	12	Flat, round, white.
Early Puritan	248	36	237	36	11	..	Long, white.
Empire State	233	12	220	..	13	12	Oval, white.
Sharpe's Seedling	224	24	200	12	24	12	Round, pink and white.
State of Maine	222	12	182	36	39	36	Round, white.
Early Six Weeks	220	..	182	36	37	24	Oblong, pink.
Lee's Favourite	220	..	180	24	39	36	Round, white.
Early Sunrise	213	24	187	..	26	24	Long, pink.
Chicago Market	211	12	189	12	22	..	Long, red.
Up to Date	211	12	167	12	44	..	Round, white.
Burpee's Extra Early	211	12	189	12	22	..	Long, pink and white.
American Wonder	209	..	193	36	15	24	Round, white.
Reading Giant	209	..	147	24	61	36	Oval, pink.
Reeve's Rose	204	36	176	..	28	36	Long, pink.
Daisy	200	12	167	12	33	..	Long, pink and white.
Early Market	193	36	154	..	39	36	Round, pink.
Bovee	191	24	158	24	33	..	Long, pink.
Early Rose	187	..	165	..	22	..	Long, pink.
Polaris	187	..	165	..	22	..	Long, white.
Clarke's No. 1	187	..	165	..	22	..	Long, pink.
Earliest of All	187	..	160	36	26	24	Long, pink.
Early Ohio	176	..	154	..	22	..	Long, pink.
Early Michigan	171	36	138	36	33	..	Long, white.

EXPERIMENTS WITH MILLET.

The land on which the millets were grown was a clay loam and had potatoes on it for a previous crop. It was manured in the fall of 1899 for the potatoes at the rate of 25 one-horse cart loads of manure per acre. The land was ploughed after the potatoes were removed and worked up the following spring with the disc, spring-tooth and smoothing harrows. The seed was sown June 5 with the Planet Junior seed drill. The plots were one-fortieth acre each. Seven varieties were sown, and the crop was cut and weighed September 14. The yield per acre was calculated from the plots as follows:—

EXPERIMENTS WITH MILLET.

Name of Variety.	Yield per Acre.	
	Tons.	Lbs.
Japanese	12	1,000
Moha Hungarian	12	800
Italian, or Indian	11	
Cat-tail	8	1,800
German, or Golden	8	200
Pearl	4	1,200

EXPERIMENTS WITH SOJA BEANS.

Experiments were again conducted with soja beans to gain information as to their value as a forage crop, and also to find out the yield per acre from this crop sown at different distances apart. The soil used was a clay loam, which had potatoes on it as a previous crop. It was manured for the potatoes in the fall of 1899 with stable manure, at the rate of 25 one-horse cart loads per acre. The land was ploughed after the potatoes were dug, and worked up the following spring with the disc, spring-tooth and smoothing harrows. The beans were sown with the Wisner seed drill, June 10, in rows 21, 28 and 35 inches apart, and the crop was cut and weighed October 1. The yield per acre has been calculated from the quantity obtained from plots of one-fortieth acre each. The crop made strong growth, but the beans had only just commenced to form at date of cutting. The season here does not appear to be long enough to bring this crop to sufficient maturity to make it valuable.

Distances apart.	Yield per Acre.	
	Tons.	Lbs.
Soja beans, 21 inches	8	1,800
" 28 "	7	1,000
" 35 "	6	400

EXPERIMENTS WITH HORSE BEANS.

Experiments were also conducted with the English horse bean, the variety 'Tick' being used. They were sown at different distances in rows 21, 28 and 35 inches apart. The soil was similar to that on which the soja beans were grown, and received the same treatment. The beans were on plots of one-fortieth acre each. These made good growth during the first part of the season, but were almost destroyed, as were all the other horse beans on the farm, by the 'Black Dolphin' horse bean aphis, which infested the plants in countless numbers.

Distances apart.	Yield per Acre.	
	Tons.	Lbs.
Horse beans, 21 inches	3	1,000
" 28 "	3	1,680
" 35 "	5	

EXPERIMENTS WITH FERTILIZERS ON WHEAT.

Experiments to test the value of different kinds of fertilizers on this grain crop were again conducted this year. The Preston wheat was used. The size of each plot was one-fortieth acre, and six plots made up the test. The land on which these tests were carried on was a poor light clay loam. The previous crop was grain, having received for that crop 100 pounds complete fertilizer per acre. This land has never had any stable manure, and having been cropped several times, was in a poor state of fertility.

The land was ploughed in the spring, and was worked up with the spring-tooth twice, and once with the smoothing harrow before seeding. The grain was sown with the seed drill June 6, and harvested September 3.

One-half of the nitrate of soda for plots 1 and 2 was sprinkled finely over the ground when the grain was 2 inches high, and the other half when it was 6 inches high. The fertilizer used in plots 4 and 5 was scattered on the ground just before sowing and lightly covered with the harrow. On plot 6 one-half of the fertilizer was scattered finely over the ground before sowing, and lightly covered with the harrow, and the other half was sprinkled over the ground when the grain was 2 or 3 inches high. Plot 3 was not fertilized, being left for a check. The results were as follows:—

Plot.	Variety of Wheat sown.	Fertilizers used per Acre.		Yield per Acre.	
			Lbs.	Bush.	Lbs.
1	Preston	Nitrate of soda	100	23	20
2	"	"	200	22	00
3	"	Check		20	00
4	"	Superphosphate	400	22	00
5	"	Muriate of potash	400	24	20
6	"	A mixture of—			
		Superphosphate	200		
		Muriate of potash	100		
		Nitrate of soda	100	23	20

SPECIAL EXPERIMENTS WITH FERTILIZERS.

Experiments for the purpose of ascertaining the relative value of fertilizers, commonly used for field crops of various kinds, were again conducted this year.

The plots were one-eighth acre each, 38 x 143½ feet, for each kind of fertilizer used. These were subdivided into ten strips 14 feet wide, each running lengthwise across all the differently fertilized plots. These strips were sown with ten different kinds of crops, namely, potatoes, mangels, turnips, carrots, corn, oats, pease, barley, wheat and mixed grain, making in all 140 plots. A margin of two feet was left between each plot, and one foot between each crop plot. Two plots were left without any fertilizers to serve as check plots. Each of the crops were sown at about the same time as the uniform test plots of the particular crop, with the same amount of seed per acre, and were cultivated in the same manner. The strips that are in grain one year are planted to roots, potatoes and corn the following year, and vice versa. The quantity and kinds of fertilizers used are applied each year. This is the third year of the test. The following table gives the yield per acre of the various crops, as calculated from the quantity obtained from each plot:—

Special Experiments with Fertilizers.

Fertilizer Used.	Barley, Duckbill.		Oats, Banner.		Wheat, Colorado.		Mixed Grain—Oats, barley, pease.		Pease, Golden Vine.		Indian Corn.		Turnips.		Mangels.		Carrots.		Potatoes—Deleware and State of Maine.	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Manure, 30 tons..........	58	16	70	20	36	40	75	16	41	40	18	1,000	29	500	24	1,000	28	1,[illegible]	396	40
Manure, 15 tons, fertilizer, 250 lbs..............	60	20	73	18	33	20	73	18	38	20	18	1,000	31	500	22	700	25	0	428	20
Complete fertilizer, 1,000 lbs....................	47	44	58	28	28	20	58	28	33	20	17	1,000	24	500	15	1,000	18	500	340	0
Complete fertilizer, 500 lbs.	45	40	52	32	25	0	55	30	30	0	14	0	23	0	16	0	18	1,000	315	0
Check (no fertilizer)......	33	16	44	26	23	20	44	4	31	40	13	0	18	1,000	15	700	15	1,000	250	0
Bone meal, 1,000 lbs.....	39	28	55	30	26	40	67	22	30	0	13	1,500	23	1,500	20	0	19	0	308	20
" 500 "	37	24	58	28	30	0	52	32	28	20	14	500	23	500	18	700	21	200	273	20
Ashes, 2,500 "	34	16	50	0	25	0	44	4	38	20	15	0	23	1,000	18	1,500	21	1,000	325	0
Manure, rotted, 20 tons ..	56	12	67	22	33	20	73	18	45	0	17	1,000	30	0	20	1,700	27	500	495	0
Check (no fertilizer)......	34	16	41	6	21	40	41	6	35	0	13	1,500	19	500	10	700	15	500	248	20
Land plaster, 500 lbs	35	20	47	2	23	20	50	0	36	40	13	1,500	19	500	9	1,950	17	500	230	0
Salt, 500 "	43	36	52	32	26	40	52	32	40	0	15	0	21	1,500	15	1,520	21	0	221	40
Marsh mud, 100 tons.....	45	40	64	24	30	0	61	26	41	40	16	0	26	500	21	500	24	800	293	20
Manure, 20 tons (green) ..	50	0	67	22	33	20	70	20	45	0	22	1,000	30	300	27	1,300	29	900	418	20

FIELD CROP OF CORN.

Two acres of corn was grown on land that had timothy as a previous crop. It was manured on the sod in the fall of 1900, with 20 one-horse cart loads of stable manure per acre. This was ploughed June 1, when a good crop of grass was turned under with the manure. The land was then worked up with the disc, spring-tooth and smoothing harrows, and the seed sown June 3 with the grain drill in rows three feet apart. This corn made excellent growth. The yield obtained was 31 tons.

Two acres was also grown on land that was previously seeded to clover in the spring of 1900, together with a pea crop. The pea aphis destroyed the pea crop, and the clover produced a grand aftermath by fall. This was manured in the autumn, and in the spring was ploughed and worked up, and the corn sown June 6 in rows 3 feet apart. The varieties 'Longfellow' and 'Selected Leaming' were mixed and sown together. The yield obtained from this field was 34 tons 650 pounds.

One acre was grown on land that was of poor fertility, not having had any manure previously. The previous crops were grain, with one crop of pease ploughed under in the year 1899. This land was manured this spring at the rate of 30 one-horse cart loads per acre, which was spread broadcast and ploughed under. It was then worked up with the disc, spring-tooth and smoothing harrows, after which the seed was sown in rows 3 feet apart. The variety, 'Angel of Midnight,' was sown. The yield from this field was 13 tons. The crop was sown June 6, and harvested October 1.

FIELD CROP OF TURNIPS.

The soil of this field was a clay loam in a poor state of fertility. It had never had any manure before. The previous crops were grain, and with the exception of a crop of pease ploughed under in 1899, no fertilizer had been previously given. The land was ploughed in the fall of 1900, and in the spring was disc-harrowed, after which 30 one-horse cart loads of stable manure per acre was spread and ploughed under. It was then worked with the disc, spring-tooth and smoothing harrows, after which 200 pounds of complete fertilizer was sown on one-half of each one acre plot.

This was harrowed in with the smoothing harrow, and drills were run 24 inches apart, and the seed sown with the turnip seeder. Four varieties were sown in one acre plots each, one-half of which were manured and fertilized, the other half having received manure only. The following yields were obtained per acre:—

FIELD CROPS OF TURNIPS.

Name of Variety and size of plots.	Yield per acre.		Yield per acre.	
	Tons	lbs.	Bus.	lbs.
½ acre plots—				
Carter's Elephant manure with fertilizer	18	1,260	621	..
" " only	16	220	537	..
Drummond Purple Top, manure with fertilizer	17	1,625	593	45
" " only	15	750	512	30
Skirvings, manure with fertilizer	18	1,275	621	15
" " only	18	795	613	15
Purple Top	18	1,800	630	..

FIELD CROPS OF MANGELS.

The land on which the field mangels were grown was a clay loam in a good state of fertility, the previous crop having been clover, the aftermath of which was ploughed under in the fall of 1900. This was disc-harrowed the following spring, and 20 one-horse cart loads of stable manure per acre was spread and ploughed under. This was then worked up with the disc, spring-tooth and smoothing harrows, after which complete fertilizer was sown broadcast at the rate of 400 pounds per acre on one-half of each one acre lot and harrowed in. The other half acre of each lot was left without any commercial fertilizer.

Drills were run 24 inches apart, and the seed planted in holes one foot apart, made with a marker and from 3 to 6 seeds were dropped in each hole. These were covered by running a land roller over the rows. Four varieties of mangels were sown in these plots, and the following yields were obtained:—

FIELD CROPS OF MANGELS.

Name of Variety and Size of Plot.	Yield per acre.		Yield per acre.	
	Tons	lbs.	Bus.	lbs.
½ acre plot—				
Mammoth Long Red, manure with fertilizer	30	1,520	1,025	20
" " only	27	120	902	..
Yellow Globe, manure with fertilizer	31	1,320	1,055	20
" " only	29	360	972	40
Yellow Intermediate, manure with fertilizer	35	600	1,176	40
" " only	34	1,150	1,162	30
Gate Post	24	1,500	825	..

HAY.

One field containing eight acres which was seeded down to clover and timothy in the spring of 1900, yielded 26 tons 320 pounds.

Three acres of clover and timothy, seeded down the same spring, yielded 5 tons 275 pounds.

One field of eight acres, seeded down the same year, yielded 19 tons 110 pounds.

This hay was all secured in excellent condition, and was grown on the upland.

Four acres of clover and timothy on the marsh, seeded down in the spring of 1900, yielded 10 tons 1,100 pounds.

Thirty-six acres of marsh also yielded 72 tons 1,310 pounds of timothy hay.

The total amount harvested was 133 tons 1,105 pounds, which was secured in first-class condition.

GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of seed grain and potatoes were again distributed this year to farmers making application from different parts of the provinces.

The following number of three-pound lots were sent to the various applicants:—

Oats	260
Barley	78
Wheat	89
Pease	22
Buckwheat	10
Winter Rye	8
Potatoes	278
Total	745

CORRESPONDENCE.

Apart from the receipt and despatch of circulars, there were 1,416 letters received and 1,211 sent out during the year.

AGRICULTURAL MEETINGS AND EXHIBITIONS.

I attended and addressed the following agricultural meetings during the year:—

New Brunswick Farmers' and Dairyman's Association Annual Meeting, Fredericton, January 22, 23 and 24.

Nova Scotia Farmers' Association Annual Meeting, Kentville, January 30, 31 and February 1.

Also farmer's meetings at Charlottetown, P.E.I., February 3.

Cardigan, P.E.I., February 4.
Middleton, P.E.I., February 8.
Charlottetown, P.E.I., February 9.
Lessonville, N.B., May 16.
Fort Lawrence, N.S., November 12.

I also addressed a series of lectures to the students of the Sussex Dairy School from 7th to 21st March.

Besides these I attended the following exhibitions:—

Winter Fair, Guelph, December 11 to 15.
Toronto Industrial, August 26 to September 7.
Pan-American Exhibition, Buffalo, N.Y.
Sussex, N.B.
Sackville, N.B.
Port Elgin, N.B.

An exhibit of farm produce was made by the Experimental Farm, Nappan, at the Nova Scotia Provincial Exhibition, Halifax, N.S., made up of the different sorts of grains, roots, fruits and vegetables grown here.

LIVE STOCK.

HORSES.

Six are the number at present kept on the farm, four of which are used exclusively for draught purposes, one for general purposes, and one driver.

During the year one horse has died. His death was caused by acute indigestion. Another of the older horses (16 years old) was exchanged for a younger and more suitable horse. Besides these, the use of one team was had during the summer months for their feed.

DAIRY CATTLE.

During the year an addition has been made to the herd of: 1 Guernsey bull, 1 Guernsey cow, 1 Ayrshire cow and 1 Ayrshire heifer, newly imported, also two Jersey cows. Some exchanges were made during the year of old and blemished cows for others. Three deaths have occurred during the year. One, an Ayrshire from milk fever, one Holstein from eversion of the uterus, and one grade cow from milk fever. The herd at present consists of:—

1 Guernsey bull, 6 years old.
1 Guernsey bull, 2½ years old.
1 Guernsey bull, 1½ years old.
1 Ayrshire bull, 1½ years old.
1 Holstein bull, 10 months old.
3 Guernsey cows.
1 Guernsey heifer, 10 months old.
2 Ayrshire cows.
2 Ayrshire cows, 3 years old.
1 Ayrshire heifer, 2 years old.
1 Ayrshire heifer, 10 months old.
1 Holstein cow.
1 Holstein cow, 3 years old.
1 Holstein heifer, 10 months old.
2 Jersey cows.
19 Grade milch cows.
6 Grade heifers, 1½ years old.
5 Grade heifers, 10 months old.

We have also at present on hand 16 grade shorthorn steers on experiment, and 12 grade shorthorn steer calves also on experiment. Total, 78 head.

EXPERIMENTS WITH COWS.

The experiment with the dairy herd during the past year was along the same lines as that of 1900, namely, to determine whether a fairly good dairy herd, well fed and cared for, would leave a credit balance after paying for feed consumed at current prices. The experiment was begun on December 2, 1900, and continued to December 1, 1901.

The price of feed this year was about the same as last year, and the prices of the products were higher than last year. Wheat bran was charged at $19.35 per ton, corn at $22.50 per ton, oats at $22.50 per ton, and pea meal, $27 per ton, making an average price of mixed meal ration, as per proportion fed to cows, of 1⅓ cents per pound. Roots were valued at 5 cents per bushel, ensilage $2 per ton, and hay at $8 per ton.

The rations fed the cows in full milk in winter was, ensilage or roots, 50 pounds; meal, 10½ pounds, and hay, 10 pounds, making an average cost of 19¾ cents per cow per day.

When not milking in winter they were charged $3 per month.

Different quantities were fed to different cows according to their capacity to consume and produce.

Thirteen were in full milk when the test began, the remainder coming fresh at various times till spring. They were kept in the stable from November 1, 1900, to June 1, 1901, except on occasional fine days when they were allowed out in the yard.

They were fed regularly twice each day, and had water before them all the time. The temperature of the stable was kept at 60° Fahrenheit, as nearly as possible all the time.

They were fed, cared for and milked as regularly as possible by the same persons all the time.

They were put to pasture early in June, and until toward the end of August were left out the greater part of the time, night and day. During September and October they were kept in the stable the greater part of the time.

With the exception of the first two weeks after being turned out, they were fed entirely in the stable, on cut green feed, clover and pease, oats and vetches grown together for that purpose, and sown at intervals of from one week to ten days apart. Owing to the extremely dry weather the crop was only fair, and at least 15 acres of green feed were consumed by the herd during the summer.

While milking in summer they were charged $2.50 per month, and $1.50 per month when dry.

The milk of each cow was weighed at milking, twice each day, and a careful record kept of the number of pounds given.

The percentage of fat in the milk of each cow was determined by the Babcock milk tester, and the fat credited to the cows on the basis that 85 pounds fat produces 100 pounds marketable butter.

The milk was sent to the Nappan dairy station, and the cows were credited with the butter produced at the prices paid to all patrons of that station, which averaged for the year 23 cents per pound, less 4 cents per pound for manufacturing butter and hauling milk.

The skim milk was fed to calves and pigs, and credited to the cows at the rate of 15 cents per 100 pounds.

The following table will show the results obtained during the year:—

Name.	Breed.	Days Milking.	Milk.	Fat.	Fat.	Butter.	Value Butter.	Value Skim Milk.	Total Credit.	Cost Feed.	Cost Making Butter.	Total Cost.	Profit.
			Lbs.	p. c.	Lbs.	Lbs.	$ cts.	$ cts	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
Molly	Ay. Sh Gr.	295	8650	3·9	337·35	396·88	91 28	8 65	99 93	46 90	15 87	62 77	37 16
Corie	"	260	8186	4·0	327·44	385·22	88 60	8 18	96 78	48 95	15 40	64 35	32 43
Aiton	Ay. Grade	309	9495	3·4	322·83	377·40	86 80	9 43	96 23	48 75	15 9	63 84	32 39
Carrie	"	253	7203	3·6	259·30	305· 6	70 16	7 20	77 36	44 15	12 20	56 35	21 1
Dolly	"	266	8229	3·1	255· 9	300·10	69 2	8 22	77 24	44 30	12	56 30	20 94
Ida B.	"	288	6267	4·0	250·68	294·91	67 82	6 26	74 8	45 80	11 79	57 59	16 49
Rex's Maud	Guernsey	211	4767	4·8	228·81	279·19	64 21	4 76	68 97	42 86	11 16	54 2	14 95
Bell	Ay Grade	239	5812	4·4	255·72	300·85	69 19	5 81	75	48 95	12 3	60 98	14 2
Lucy	Sh. Ay. Gr.	288	7716	3·1	239·19	281·40	64 72	7 71	72 43	47 36	11 25	58 61	13 82
Ilda Rooker	Holstein	340	7070	3·4	240·38	282·80	65 4	7 7	72 11	47 65	11 31	58 96	13 15
Jesse P.	Ay. Gr.	239	6056	3·6	218· 1	256·49	58 99	6 5	65 4	42 18	10 25	52 43	12 61
Ida Rooker	Holstein	237	7490	3·3	247·17	290·78	66 87	7 49	74 36	51 95	11 63	63 58	10 78
Annie	Sh. Ay. Gr.	190	4966	3·8	188·70	222·	51 6	4 96	56 2	42 27	8 88	51 15	4 87
Lady Lockerby	Ayrshire	239	5297	3·6	190·69	224·34	51 59	5 29	56 88	43 54	8 97	52 51	4 37
Daisy	Ay. Gr.	309	6227	3·4	211·71	249· 8	57 28	6 22	63 50	49 50	9 96	59 46	4 4
Templeton	"	288	5632	3·4	191·48	225·28	51 81	5 63	57 44	45 42	9 1	54 43	3 1
Alice	Ayrshire	330	5038	4·0	201·52	237· 8	54 52	5 3	59 55	47 22	9 48	56 70	2 85
Ada C.	Ay. Gr.	204	4196	4·0	167·84	197·45	45 41	4 19	49 60	39 65	7 89	47 54	2 6
Beatrice	Ayrshire	260	3869	4·8	185·71	218·48	50 25	3 86	54 11	43 67	8 73	52 40	1 71
Polly	Ay. Gr.	239	4196	3·9	163·64	192·52	44 27	4 19	48 46	39 5	7 70	46 75	1 71
													Loss.
Jane	"	225	4648	3·6	167·32	196·85	45 27	4 64	49 91	46 25	7 87	54 12	4 21
Violet	"	288	4909	3·0	147·27	173·25	39 84	4 90	44 74	44 90	6 93	51 83	7 09

EXPERIMENTS WITH STEERS.

This test was carried on with a view to establish some data as regards the advisability of dehorning full grown steers at the commencement of their feeding period, whether fed in loose boxes or tied in stalls.

Twenty-one 3½-year old steers and three 2½ years old were used for this test, in 3 lots of 8 each of as nearly as possible equal form, features and weight (shorthorn grades).

They were bought on October 30 and weighed the next morning, after having fasted 14 hours. The horns were then taken off lots 1 and 2 and left on lot 3. Lot 1 was put into loose box stalls, and lots 2 and 3 were tied up in stalls.

The dehorning was done with the keystone dehorning clipper.

While all bled profusely, few seemed to suffer much, although by careful weighing before, and repeatedly after dehorning, it was again found that at least two weeks were required to regain the loss in weight from dehorning.

All lots were fed alike as nearly as possible from start to finish of test, and kept in the stable all the time, except on occasional fine days when they were let out for a time, averaging not more than once each week.

Another lot of 4 of the same ages and quality as the others, as near as possible, were dehorned, fed and cared for in precisely the same manner as lots 1, 2 and 3, with the exception of being turned out daily for water.

The feeds were charged at the following prices:—Hay, $8 per ton; straw, $3 per ton; roots, $2 per ton; ensilage, $2 per ton; mixed meals averaged $22.50 per ton as per proportion fed.

RECORD of Steers fed from November 16, 1900, to March 31, 1901.

LOT I.—DEHORNED, FED IN LOOSE BOX.

Numbers.	Nov. 16.	Dec. 1.	Gain.	Dec. 16.	Gain.	Dec. 31.	Gain.	Jan. 15.	Gain.	Jan. 30.	Gain.	Feb. 14.	Gain.	Mar. 1.	Gain.	Mar. 16.	Gain.	Mar. 31.	Gain.	Total Gains.
	Lbs.	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.
17	1,385	1,430	45	1,450	20	1,520	70	1,575	55	1,620	40	1,650	30	1,670	20	1,690	20	1,715	25	330
18	1,320	1,350	30	1,400	50	1,475	75	1,525	50	1,560	35	1,605	45	1,635	30	1,650	15	1,670	20	350
19	1,250	1,310	60	1,340	30	1,400	60	1,415	15	1,450	35	1,485	35	1,520	35	1,550	30	1,575	25	325
20	1,275	1,300	25	1,350	50	1,405	55	1,445	40	1,490	45	1,525	35	1,550	25	1,585	35	1,615	30	340
21	1,200	1,220	20	1,300	80	1,360	60	1,380	20	1,420	40	1,455	35	1,500	45	1,520	20	1,545	25	345
22	1,230	1,275	45	1,315	40	1,325	10	1,350	25	1,400	50	1,450	50	1,470	20	1,480	10	1,490	10	260
23	1,150	1,175	25	1,200	25	1,280	80	1,325	45	1,400	75	1,450	50	1,470	20	1,495	25	1,515	20	365
24	1,080	1,100	20	1,125	25	1,200	75	1,225	25	1,275	50	1,325	50	1,340	15	1,390	50	1,415	25	335
Totals	9,890	10,160	270	10,480	320	10,965	485	11,240	275	11,615	370	11,945	330	12,155	210	12,360	205	12,540	180	2,650

LOT II.—DEHORNED, TIED IN STALLS.

Numbers.	Nov. 16.	Dec. 1.	Gain.	Dec. 16.	Gain.	Dec. 31.	Gain.	Jan. 15.	Gain.	Jan. 30.	Gain.	Feb. 14.	Gain.	Mar. 1.	Gain.	Mar. 16.	Gain.	Mar. 31.	Gain.	Total Gains.
1	1,450	1,535	85	1,570	35	1,625	55	1,675	50	1,695	20	1,710	15	1,780	70	1,805	25	1,810	5	360
2	1,300	1,325	25	1,385	60	1,425	40	1,470	45	1,510	40	1,545	35	1,565	20	1,585	20	1,605	20	305
3	1,375	1,430	55	1,460	30	1,475	15	1,500	25	1,540	40	1,575	35	1,605	30	1,630	25	1,655	25	280
4	1,260	1,280	20	1,340	60	1,350	10	1,430	80	1,470	40	1,500	30	1,525	25	1,545	20	1,550	5	290
5	1,340	1,350	10	1,400	50	1,445	45	1,490	45	1,520	30	1,550	30	1,585	35	1,600	15	1,610	10	270
6	1,250	1,290	40	1,340	50	1,375	35	1,425	50	1,430	5	1,440	10	1,480	40	1,500	20	1,520	20	270
7	1,135	1,200	65	1,215	15	1,235	20	1,270	35	1,300	30	1,320	20	1,355	35	1,360	5	1,390	30	255
8	1,015	1,060	45	1,080	20	1,100	20	1,130	30	1,165	35	1,200	35	1,220	20	1,245	25	1,270	25	255
Totals	10,125	10,470	345	10,790	320	11,030	240	11,390	360	11,630	240	11,840	210	12,115	275	12,270	155	12,410	140	2,285

Record of Steers fed, November 16 to March 31, 1901—*Concluded.*

LOT III.—NOT DEHORNED, TIED IN STALLS.

Numbers.	Nov. 16.	Dec. 1.	Gain.	Dec. 16.	Gain.	Dec. 31.	Gain.	Jan. 15.	Gain.	Jan. 30.	Gain.	Feb. 14.	Gain.	Mar. 1.	Gain.	Mar. 16.	Gain.	Mar. 31.	Gain.	Total Gains.
	Lbs.	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.	Lbs	Lbs.
9	1,370	1,375	5	1,410	35	1,460	50	1,490	30	1,525	35	1,555	30	1,575	20	1,600	25	1,625	25	255
10	1,320	1,375	55	1,390	15	1,430	40	1,460	30	1,490	30	1,525	35	1,535	10	1,565	30	1,600	35	280
11	1,330	1,360	30	1,400	40	1,410	10	1,450	40	1,490	40	1,535	45	1,560	25	1,605	45	1,610	5	280
12	1,310	1,365	55	1,390	25	1,410	20	1,500	90	1,540	40	1,570	30	1,580	10	1,610	30	1,640	30	330
13	1,200	1,230	30	1,275	45	1,300	25	1,330	30	1,360	30	1,385	25	1,395	10	1,425	30	1,455	30	255
14	1,160	1,190	30	1,250	60	1,275	25	1,330	55	1,360	30	1,385	25	1,425	40	1,440	15	1,460	20	300
15	1,120	1,150	30	1,175	25	1,210	35	1,220	10	1,260	40	1,300	40	1,340	40	1,365	25	1,375	10	255
16	1,120	1,150	30	1,200	50	1,230	30	1,300	70	1,310	10	1,320	10	1,340	20	1,365	25	1,390	25	270
Totals	9,930	10,195	265	10,490	295	10,725	235	11,080	355	11,335	255	11,575	245	11,750	175	11,975	225	12,155	180	2,225

LOT IV.—DEHORNED, FED IN LOOSE BOX, TURNED OUT TO WATER.

Numbers.	Nov. 16.	Dec. 1.	Gain.	Dec. 16.	Gain.	Dec. 31.	Gain.	Jan. 15.	Gain.	Jan. 30.	Gain.	Feb. 14.	Gain.	Mar. 1.	Gain.	Mar. 16.	Gain.	Mar. 31.	Gain.	Total Gains.
25	1,060	1,080	20	1,140	60	1,200	60	1,215	15	1,260	45	1,320	60	1,340	20	1,360	20	1,380	20	320
26	1,020	1,030	10	1,060	30	1,125	65	1,135	10	1,145	10	1,195	45	1,220	25	1,260	40	1,290	30	270
27	1,025	1,075	50	1,115	30	1,150	35	1,175	25	1,200	25	1,250	50	1,270	20	1,290	20	1,310	20	285
28	975	1,010	35	1,035	25	1,070	35	1,095	25	1,125	30	1,165	40	1,175	10	1,210	35	1,230	20	255
Totals	4,080	4,195	115	4,350	145	4,545	195	4,620	75	4,730	110	4,930	200	5,005	75	5,120	115	5,210	90	1,130

COST OF 1 STEER PER DAY FOR ENTIRE PERIOD.

Period.	Daily Ration.	Daily Cost.	Cost for Period.	—
		$ cts.	$ cts.	$ cts.
Nov. 16 to Dec. 1	Roots, 90 lbs	0 09	1 35	
	Meal, 2 lbs	0 02¼	0 33¾	
	Straw, 10 lbs	0 02½	0 37½	
				2 06¼
Dec. 1 to Dec. 31	Roots, 60 lbs	0 06	1 80	
	Meal, 4 lbs	0 4½	1 35	
	Hay, 10 lbs	0 04	1 20	
				4 35
Dec. 31 to Jan. 30	Roots, 50 lbs	0 05	1 50	
	Meal, 6 lbs	0 06¾	2 02½	
	Hay, 15 lbs	0 06	1 80	
				5 32½
Jan. 30 to March 1	Roots, 30 lbs	0 03	0 90	
	Meal, 8 lbs	0 09	2 70	
	Hay, 12 lbs	0 05	1 50	
				5 10
March 1 to March 31	Ensilage, 20 lbs	0 02	0 60	
	Meal, 9 lbs	0 10⅛	3 03¾	
	Hay, 12 lbs	0 05	1 50	
				5 13¾
Cost of feed of 1 steer				21 97½
" 28 steers				615 30

Original weight 34,025 lbs. steer at 4⅛c. per lb	$1,403 53
Weight at finish, 42,315 lbs. at 5⅛c. per lb	2,168 64
Balance	765 11
Cost of feed for lot, 135 days	615 30
Net profit	149 81

Daily rate of gain per steer	2·19
Cost of 1 lb. gain	7·42c.
" feed per day per steer	16·27c.
Profit per steer	$5.35

STEER-CALF EXPERIMENTS.

With a view to getting some particulars as to the cost of a beef bullock when ready for market, and also a comparison of limited and full feeding, twelve shorthorn grade calves were brought early in May, and divided into two groups of six each.

Lot No. 1 was fed what is termed a 'full fattening ration.'

Lot No. 2 was fed what is termed a 'limited growing ration.'

In estimating the cost of feeding calves, the following values were placed on the various feeds:—

New milk, $1 per 100 pounds.
Skim milk, 15 cents per 100 pounds.
Bibby's Cream Equivalent, $3.50 per 100 pounds.
Wheat bran, 95 cents per 100 pounds.
Crushed oats, $1 per 100 pounds.
Roots or ensilage, 10 cents per 100 pounds.
Hay, $8 per ton.

FULL FATTENING RATION—SIX STEERS, CALVES.

Period.	Daily Ration per Calf.	Amount Fed during Period.	Cost.	Total Cost.
		Lbs.	$ cts.	$ cts.
May 16 to June 1........	12 lbs. whole milk..	1,080	10 80	
	8 " skim milk	720	1 08	
				11 88
June 1 to July 1	10 " whole milk........	1,800	18 00	
	10 " skim milk	1,800	2 70	
	¼ " bran and oil cake.. .... - ...	37½	0 37	
				21 07
July 1 to Aug. 1	8 " whole milk....................	1,488	14 88	
	12 " skim milk	2,232	3 34	
	½ " bran and oil cake...............	93	0 93	
				19 15
Aug. 1 to Sept. 1........	20 " skim-milk	3,720	5 58	
	1 " cream equivalent..	186	6 50	
	½ " bran and oil cake...............	93	0 93	
	2 " hay	372	1 49	
				14 50
Sept. 1 to Oct. 1	10 " skim-milk......................	1,800	2 70	
	1 " cream equivalent.......	180	6 30	
	½ " bran and oil cake..........	90	0 90	
	2 " hay	360	1 44	
				11 34
Oct. 1 to Nov. 1.	10 " ensilage	1,860	1 86	
	1 " crushed oats.....	186	1 86	
	½ " bran and oil cake...............	93	0 93	
	2 " hay	372	1 49	
				6 14
Nov. 1 to Dec. 1	20 " roots......................	3,600	3 60	
	1 " crushed oats..............	180	1 80	
	½ " bran and oil cake..	90	0 90	
	2 " hay	360	1 44	
				7 74
				91 82

FULL FATTENING RATION—SIX STEERS, CALVES.

Period.	Weight at Start.	Weight at Finish.	Gain.
1900.	Lbs.	Lbs.	Lbs.
May 16 to June 1........	1,000	1,130	130
June 1 to July 1..........	1,130	1,435	305
July 1 to Aug. 1..	1,435	1,810	375
Aug. 1 to Sept. 1.	1,810	2,160	350
Sept. 1 to Oct. 1..	2,160	2,460	300
Oct. 1 to Nov. 1........	2,460	2,730	270
Nov. 1 to Dec. 1.....	2,730	2,975	245

Total gain, May 16 to Dec 1	Lbs.	1,975
Weight at start	"	1,000
" finish..................................	"	2,975
Daily rate of gain per steer...............	p. c.	1·64
Cost of 1 lb. gain......	cts.	4·64
" feed per day per steer	"	7·72
" " of lot, 198 days............................	$	98·1

LIMITED GROWING RATION—SIX STEERS, CALVES.

Period 1900.	Daily Ration per Calf.	Amount fed during period.	Cost.	
		Lbs.	$ cts.	
May 16 to June 1	8 lbs. whole milk	720	7 20	
	12 lbs. skim-milk	1,080	1 62	8 82
June 1 to July 1	8 lbs. whole milk.:.....	1,440	14 40	
	12 lbs. skim-milk	2,160	3 24	17 64
July 1 to August 1........	20 lbs. skim-milk....................	3,720	5 58	
	½ lb. cream equivalent......	93	3 25	8 83
August 1 to Sept. 1... . . .	20 lbs. skim-milk............	3,720	5 58	
	½ lb. cream equivalent.	93	3 25	
	½ lb. bran and oil cake..............	93	0 93	
	2 lbs. hay........	372	1 49	11 25
Sept. 1 to Oct. 1	10 lbs. skim-milk........	1,800	2 70	
	½ lb. cream equivalent............ ...	90	3 15	
	½ lb. bran and oil cake.....	90	0 90	
	2 lbs. hay.........	360	1 44	8 19
Oct. 1 to Nov. 1......	5 lbs. ensilage...	930	0 93	
	½ lb. crushed oats.......,........ ...	93	0 93	
	½ lb. bran and oil cake..........	93	0 93	
	2 lbs. hay.........	372	1 49	4 28
Nov. 1 to Dec. 1	10 lbs. roots...................... .	1,800	1 80	
	½ lb. crushed oats...........	90	0 90	
	½ lb. bran and oil cake....	90	0 90	
	2 lbs. hay....	360	1 44	5 04
				64 05

LIMITED GROWING RATION—SIX STEERS—CALVES.

Period 1900.	Weight at Start.	Weight at Finish.	Gain.
	Lbs.	Lbs.	Lbs.
May 16 to June 1	920	1,010	90
June 1 to July 1	1,010	1,260	250
July 1 to August 1.	1,260	1,540	280
August 1 to Sept. 1.....	1,540	1,805	265
Sept. 1 to Oct. 1..................................	1,805	2,005	200
Oct. 1 to Nov. 1.......	2,005	2,220	215
Nov. 1 to Dec. 1	2,220	2,375	155

Total gain, May 16th to December 1st	1,455 lbs.
Weight at start....	920 "
" finish..........................	2,375 "
Daily rate of gain per steer......	1·22 lbs.
Cost of 1 lb. gain... ...	4·40 cts.
" feed per day per steer	5·39 "
" feed of lot, 198 days.....	$64 05

PIGS.

The herd of pigs at present on this farm consists of Yorkshires, Berkshires, Tamworths and their crosses, in all 60 head, as follows:—

1 Yorkshire boar, registered.
1 Yorkshire sow, registered.
1 Berkshire boar, registered.
1 Berkshire sow, registered.
1 Tamworth sow, registered.
5 Grade brood sows.
50 Grade pigs from one to five months old.

TEST OF DIFFERENT FEEDS FOR SWINE.

This experiment was carried on with a view to determine the comparative feeding value of the following feeds:—

1st, buckwheat; 2nd, shorts; 3rd, corn meal and crushed oats; 4th, pea meal and crushed oats; the last two mentioned being fed in the ratio of 2 to 1. This has been carried on during the past three years.

The pigs were put into the test at the age of 3 months, in lots of four, from the same litters, at their live weight, after fasting 14 hours.

The ration complete consisted of three pounds of the above mentioned feeds, and an average of five pounds of skim milk per pig per day. When ready for market, one pig was taken from each lot each time, and these were replaced by four from another litter.

Their gains were ascertained from their increased live weight, after fasting 14 hours.

They were dressed for market on the farm, and the percentage of dressed weight ascertained in each case.

Pen No 1.—Feed.—2 lbs. Corn Meal, 1 lb. Crushed Oats and Skim Milk.

No.	Breed.	Weight at start.	Weight at finish.	Net gain.	Number of days fed.	Daily gain.	Percentage of dressed weight.
1	Berkshire	96	170	74	60	1·23	79·21
2	Yorkshire	82	180	98	60	1·63	78·40
3	Tamworth	72	160	88	54	1·64	78·68
4	Yorkshire (D), Berkshire (S)	69	150	81	57	1·59	77·10
5	" "	65	151	86	61	1·40	77·60
6	" Tamworth (S)	65	169	104	58	1·79	81·25

Pen No. 2.—Feed.—2 lbs. Pea Meal, 1 lb. Crushed Oats and Skim Milk.

No.	Breed.	Weight at start.	Weight at finish.	Net gain.	Number of days fed.	Daily gain.	Percentage of dressed weight.
1	Berkshire	91	164	73	60	1·21	80·21
2	Yorkshire	87	178	91	60	1·51	80· 2
3	Tamworth	82	190	88	54	1·62	79·64
4	Yorkshire (D), Berkshire (S)	77	154	77	57	1·35	78· 1
5	" "	76	149	73	61	1·19	78·33
6	" Tamworth (S)	94	204	110	58	1·89	82·10

PEN NO. 3.—Feed.—3 lbs. Shorts and Skim Milk.

No.	Breed.	Weight at start.	Weight at finish.	Net gain.	Number of days fed.	Daily gain.	Percentage of dressed weight.
1	Berkshire	100	168	68	60	1·13	80·32
2	Yorkshire	77	165	88	60	1·46	77·42
3	Tamworth	94	182	88	54	1·62	78·61
4	Yorkshire (D), Berkshire (S)	69	150	81	57	1·42	78·34
5	" "	73	152	79	61	1·29	79·34
6	" Tamworth (S)	81	198	117	58	2·01	81·40

PEN NO. 4.—Feed.—3 lbs. Buckwheat and Skim Milk.

No.	Breed.	Weight at start.	Weight at finish.	Net gain.	Number of days fed.	Daily gain.	Percentage of dressed weight.
1	Berkshire	87	154	67	60	1·11	79· 1
2	Yorkshire	84	175	91	60	1·51	78·43
3	Tamworth	79	161	82	54	1·51	79·63
4	Yorkshire (D), Berkshire (S)	78	153	75	57	1·31	77·46
5	" "	67	147	80	61	1·31	78·25
6	" Tamworth (S)	92	187	95	58	1·64	80·62

SHEEP.

The flock on this farm at present consists of:—

1 Pure bred Leicester ram.

5 Pure bred Leicester ewes.

6 Pure bred yearling Shropshire ewes.

6 Grade Shropshire ewes.

All are in fairly good condition.

POULTRY.

Four varieties of fowls were kept this year. Barred Plymouth Rocks, Black Minorcas, White Leghorns and White Wyandottes. The B. P. Rocks, B. Minorcas and W. Wyandottes were all young birds, and the W. Leghorns, with one exception, were old birds.

The pens were made up as follows:—

No. 1. 10 B. P. Rock hens.

No. 2. 7 B. Minorca hens.

No. 3. 6 W. Leghorn hens.

No. 4. 2 W. Wyandotte hens.

During the winter they were fed on a warm corn meal and shorts mash in the morning, and whole grain in the afternoon scattered on the floor of the pens. Water was before them all the time, and green ground bones and oyster shells were occasionally given them.

The eggs laid during the year by the different breeds were as follows:—

B. P. Rocks	450
B. Minorcas	400
W. Leghorns	268
W. Wyandottes	74

A 120-egg incubator was purchased from the T. A. Willetts Co., of Toronto, Ont., and one hatch taken off in May. One hundred and twenty eggs were put in.

At the end of 10 days, 38 eggs were found unfertile, and 64 chickens were hatched from the remaining 82 eggs. The chicks were very healthy, and none died.

The fowls now on hand are:—

	Cocks.	Cockerels.	Hens.	Pullets.
B. P. Rocks	1	4	5	5
B. Minorcas	1	..	4	1
W. Leghorns	1	3	5	7
W. Wyandottes	1	..	2	2

BEES

On December 5, 1900, four colonies of bees, weighing respectively 56½, 53, 52 and 44 pounds were put in winter quarters.

They were kept at a temperature ranging from 32° to 40° all winter, and put on their summer stands on April 17, 1901. The three swarming colonies then weighed 45, 40 and 40 pounds respectively, the other colony having died during the winter.

Although this season seemed to be favourable, the bees neither gave off many swarms, nor made much honey. One swarm was captured on July 2. They were put in their winter quarters this year on the 28th November, weighing 64, 60, 56 and 56 pounds respectively. No honey was taken from them this season.

I have the honour to be, sir,

Your obedient servant,

R. ROBERTSON,

Superintendent.

REPORT OF THE HORTICULTURIST.

(W. S. BLAIR.)

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith a report of some of the work done in the horticultural department of the Experimental Farm for the maritime provinces for the year 1901.

The spring opened up very early, making it possible to cultivate in parts of the orchard on the 19th of April. In May the temperature was moderate with but one frost on the 2nd of 6°. The average highest and lowest temperatures for the months of May, June, July, August and September for this year, as compared with 1900, are as follows:—

—	Maximum.		Minimum.	
	1900.	1901.	1900.	1901.
May	55·9°	55·3°	36·3°	40·9°
June	68·°	69·8°	46·1°	48·9°
July	75·°	76·4°	54·°	54·1°
August	71 8°	75·7°	52·4°	54·9°
September	65·4°	68·2°	41·4°	43·7°

It will be seen that the season throughout has been decidedly warmer than last year. The temperature, especially for the month of September, continued uniformly high, and the season continued mild well along into October; the first frost occurring on October 8 of 1°, and the next October 22 of 10°.

The season, however, was extremely dry, but this did not injure the fruit crop with the exception of the raspberries and blackberries, which were almost a total failure. The apple trees made splendid growth and produced a medium crop of good fruit. The season has been noted for producing apples, the greater proportion of which were marketable. The apple scab was not so prevalent as usual, and the fruit that set matured in fine form.

The crop of apples is reported very light in many places. This seems to be the case especially where the trees have not been given proper attention in the past. I have noticed that orchards which have received good care gave a fair crop of fruit, while those adjoining which had received but little attention were without fruit at all. It is also said that in the Cornwallis and Annapolis valleys those who have paid particular attention to cultivating and fertilizing their orchards do not complain of the

season's fruit yield, while some whose orchards have been neglected are having but poor crops.

The Bordeaux mixture was used this year at the Nappan farm on all fruit trees. The apple scab fungus was more easily kept in check than usual, the weather continuing without any heavy rains made a less number of sprayings efficient. The plum aphis was the most troublesome pest to deal with. The most thorough work is necessary to kill all these insects, and several sprayings were required to rid the trees of this aphis. Tobacco water proves the cheapest and most effective material tried. The apple aphis, or apple plant louse, was also noticed on some apple trees, but only in small numbers.

The crop of cherries was very small, and outside of an English Morello and a few Orel trees no fruit was obtained. A few of the pear trees ripened fruit. The variety known as Osband's Summer gave some good specimens. The plum crop was very good. The plums which fruited well were Prince's Yellow Gage, Moore's Arctic, Saunders, Washington, Imperial Gage, German Prune and Italian Prune. The yield of strawberries was above the average.

The collection of annual flowering plants did not produce as fine bloom as usual owing to the dry weather. The perennial sorts gave splendid bloom. The ornamental trees and shrubs made good growth, and a report is here made of the varieties now growing at Nappan.

Experiments were conducted with vegetables of various kinds, and particulars of some of the tests will be found in this report.

I beg to acknowledge the following donations:—

Mr. A. M. Shaw, Stewiacke, N.S., cherry trees.

Mr. Leander Freen, Upper Malagash, N.S., cherry trees and Stark apple scions.

Peter Henderson & Co., New York, Prosperity peas and Metropolitan corn.

G. H. Haszard, Charlottetown, P.E.I., Cactus dahlias and King Edward VII. peas.

ORNAMENTAL TREES AND SHRUBS.

The ornamental trees and shrubs planted from time to time have made good growth during the past season. A list of those varieties now growing, the date of planting, their present growth, and the character of their growth is given in the following table.

There are 201 different sorts of deciduous trees and shrubs, and 56 kinds of evergreen trees and shrubs now growing on the farm. As far as possible the common names of these shrubs and trees are given, together with their botanical names. The botanical and common names used in the published catalogue of ornamental trees and shrubs growing at the Central Experimental Farm at Ottawa are used in this list.

Name of Variety.	When planted.	Present height.	Diameter of head.	Character of growth.	Remarks.
Deciduous.		Feet.	Feet.		
1 Acer platanoides—*Norway Maple*	1893	20½	11	Strong..	Fine ornamental tree.
2 Acer platanoides Schwedleri—*Schwedler's Maple*	1897	9	5	" ..	Very fine.
3 Acer Saccharinum—*Sugar or Rock Maple*	1892	13	7½	" ..	Valuable ornamental tree.
4 Acer Negundo—*Box Elder*	1892	13	10½	" ..	A fine rapid grower.
5 Acer tataricum Ginnala—*Ginnalian Maple*	1892	9	8	" ..	Valuable shrub when young.
6 Acer pseudoplatanus—*Sycamore Maple*	1897	5½	4½	Fair....	Not thrifty.

Name of Variety.	When planted.	Present height.	Diameter of head.	Character of growth.	Remarks.
7 Acer pennsylvanicum—*Striped Maple*	1899	5½	4	Strong..	Very good.
8 Acer platanoides Reitenbachi	1887	9½	5½	" ..	"
9 Acer pseudo-platanus Worleei	1897	6	5	Fair....	"
10 Acer Monspessulanum—*Montpellier Maple*	1897	3½	4	" ..	A low growing maple.
11 Æsculus turbinata—*Variegated Horse Chestnut*	1900	1	......	" ..	
12 Alnus glutinosa imperialis—*Imperial Cut-leaved Alder*	1897	8	7	Strong..	Top kills back in winter.
13 Alnus cordifolia—*Heart-leaved Alder*	1899	4	4	Fair....	" "
14 Aristolochia Sipho—*Dutchman's Pipe*	1899	1½	......	" ..	Makes strong growth.
15 Artemisia abrotanum—*Southernwood*	1894	4	5½	Strong..	A useful shrub.
16 Berberis Thunbergi—*Thunberg's Barberry*	1893	4	5½	" ..	Fine dwarf Barberry.
17 Berberis Aquifolium—*American Holly*	1897	2	3½	" ..	Very fine.
18 Berberis Sieboldii—*Siebold's Barberry*	1897	3	3½	" ..	"
19 Berberis Amurensis—*Amur Barberry*	1898	3	3¼	" ..	Fair.
20 Berberis Hybrid No. 2	1899	2¾	2½	" ..	Rapid grower.
21 Berberis Spathulata	1900	1	......	" ..	
22 Betula alba—*European White Birch*	1900	27	16	" ..	Fine ornamental tree.
23 Betula alba pendula Youngi—*Young's Weeping Birch*	1899	4½	4	" ..	Very fine.
24 Betula alba purpurea—*Purple-leaved Birch*	1897	10½	6½	" ..	"
25 Betula pumila—*Low Birch*	1901	1½	2	" ..	
26 Betula alba fastigiata—*Pyramidal Birch*	1897	15	6	" ..	A valuable variety.
27 Betula alba laciniata pendula—*Cut-leaved Birch*	1899	4½	3	" ..	Very fine.
28 Calycanthus floridus—*Carolina Allspice*	1899	2	1½	Fair....	Very good.
29 Caragana arborescens—*Siberian Pea Tree*	1891	7	8	Strong..	Very good, in full bloom June 10.
30 Caragana pygmæa—*Dwarf Caragana*	1898	2½	2½	" ..	Very good.
31 Caragana frutescens—*Woody Caragana*	1897	4	3	" ..	A fine variety.
32 Carpinus Caroliniana—*Blue Beech*	1899	1½	1	Weak..	
33 Catalpa Cordifolia	1900	3	1½	Strong.	Kills back.
34 Catalpa Kaempferi	1901	2	1	" ..	"
35 Celastrus Articulatus—*Japanese Bitter-sweet*	1899	5½	4½	" ..	Climber.
36 Celastrus Scandens—*Climbing Bitter-sweet*	1899	5½	3	" ..	"
37 Cephalanthus occidentalis—*Button Bush*	1898	2	2	Weak..	
38 Cercidiphyllum Japonicum—*Katsura Tree*	1897	2¾	2	Fair....	Very fine.
39 Clematis Vitalba—*Common Traveller's Joy*	1899	8	......	Strong..	Good climber.
40 Clematis Viticella	1899	6½	......	" ..	"
41 Clematis Montana—*Mountain Clematis*	1900	10	......	" ..	"
42 Cornus sanguinea—*Red-branched Dogwood*	1898	3½	4	" ..	Very good.
43 Cornus alba sibirica variegata—*Variegated Dogwood.*	1898	3	3½	" ..	Very fine.
44 Cornus Baileyi	1897	5½	5	" ..	"
45 Cornus Amomum	1897	3½	4	" ..	
46 Cornus Spaethii	1899	1½	1	Fair....	
47 Cornus Mascula Variegata—*Variegated Cornelian Cherry*	1899	1½	½	Weak..	
48 Cornus sanguinea elegantissima	1899	1½	1	Fair....	
49 Cotoneaster tomentosa—*Common Cotoneaster*	1898	3	5	Strong..	Very good.
50 Cotoneaster Acutifolia—*Sharp-leaved Cotoneaster*	1895	3	4	" ..	"
51 Cotoneaster laxiflora	1899	3½	5	" ..	Very fine.
52 Crataegus tomentosa—*Black Haw*	1897	3	4	" ..	"
53 Crataegus Oxyacantha flore rubro pleno—*Double red-flowering White Thorn*	1899	2½	1½	Fair....	"
54 Cytisus purpureus	1897	1½	2	Strong..	Full bloom June 15.
55 Cytisus triflorus	1898	1	3	" ..	Very fine.
56 Daphne Mezereum	1901	½	......	Weak..	
57 Deutzia hybrida Wellsii	1894	2½	2½	Fair....	Full bloom July 12.
58 Deutzia gracilis variegata	1898	1½	1½	Weak..	
59 Deutzia gracilis	1899	1	1	" ..	
60 Diervilla hortensis A. Carrière	1897	4	4½	Strong..	Winter kills slightly.
61 Diervilla florida Stelznerii	1897	4	4	" ..	"
62 Diervilla Candida—*Weigela Candida*	1898	4	5	" ..	"
63 Diervilla florida—*Weigela Rosea*	1894	4½	5	" ..	"
64 Diervilla florida alba—*Weigela Rosea Alba*	1892	4½	5	" ..	Winter kills slightly.
65 Diervilla hybrida Aurea—*Weigela Aurea*	1894	1½	1½	Fair....	Winter kills badly.
66 Elaeagnus Argentea—*Wolf Willow*	1899	3½	2	Strong..	Valuable.
67 Euonymus Americanus—*Spindle Tree*	1897	4	2	" ..	Valuable.

	Name of Variety.	When planted.	Present height.	Diameter of head.	Character of growth.	Remarks.
			Feet.	Feet.		
68	Forsythia suspensa—*Golden Bell*	1899	3	3½	Fair....	Very fine.
69	Forsythia variegata—*Variegated Golden Bell*	1899	2½	2	"	"
70	Fraxinus Americana—*White Ash*	1890	24	18	Strong..	Valuable tree.
71	Genista tinctoria Sibirica—*Siberian Green-weed*	1899	1	2½	" ..	Very fine.
72	Gleditschia triacanthos—*Honey Locust*	1898	3	3	" ..	"
73	Hamamelis Virginica—*Witch Hazel*	1901	2½	2	Fair....	Valuable.
74	Hippophæ rhamnoides—*Sea Buckthorn*	1899	2	1½	"	Very fine.
75	Hydrangea paniculata	1897	5	5	Strong..	"
76	Juglans cinerea—*Butternut*	1890	12	8	" ..	Valuable tree.
77	Juglans Sieboldiana—*Japanese Walnut*	1898	5	1	Weak ..	
78	Ligustrum Amurense—*Amur Privet*	1895	5	5	Strong..	Fine shrub.
79	Ligustrum vulgare aureum—*Golden Privet*	1899	1½	1½	" ..	Very fine.
80	Ligustrum Ibota	1897	4½	4	" ..	Bloom July 20.
81	Ligustrum sinense	1897	4½	4	" ..	Very fine.
82	Ligustrum ovalifolium variegata—*Variegated California Privet*	1897	3½	3	Fair....	"
83	Liriodendron tulipifera—*Tulip Tree*	1897	4	3	Strong..	Kills back, slightly.
84	Lonicera Chrysantha—*Amur Bush Honeysuckle*	1892	10	7	" ..	Very good.
85	Lonicera tatarica flore rubro—*Tartarian Bush Honeysuckle*	1894	7	8	" ..	"
86	Lonicera Alberti—*Albert Regel's Honeysuckle*	1898	2	3½	" ..	Very fine.
87	Lonicera hirsuta—*Hairy Honeysuckle*	1901	1	......	" ..	
88	Lonicera cærulea graciliflora	1899	3½	3	" ..	Very good.
89	Lonicera Periclymenum—*English Honeysuckle*	1899	5	...	" ..	Good climber.
90	Lycium Chinense—*Matrimony Vine*	1899	3	1½	" ..	Very fine.
91	Menispermum dauricum—*Moonseed*	1898	5	......	" ..	Climber.
92	Periploca græca	1900	2	......	" ..	"
93	Philadelphus hybridus Lemoinei—*Mock Orange*	1898	2	2	" ..	Very fine.
94	Philadelphus nivalis spectabilis plenus	1899	1	1	Fair....	
95	Philadelphus inodorus speciosus grandiflorus	1897	5	4½	Strong..	Bloom July, very fine.
96	Philadelphus hybridus Lemoinei—*Boule d'Argent*	1900	1½	1	Fair....	
97	Philadelphus Dentziæflorus	1898	2	1½	Strong..	Very fine.
98	Philadelphus coronarius	1897	4	4	" ..	"
99	Philadelphus grandiflorus—*Large-flowered Mock Orange*	1898	2½	2½	Fair....	"
100	Philadelphus hirsutus	1899	1½	1	"	
101	Philadelphus Keteleerii flore pleno	1901	½	......	"	
102	Philadelphus cordifolius	1900	1	1	" ..	
103	Philadelphus nivalis	1899	1	1½	"	
104	Populus alba pyramidalis—*Silver Poplar*	1891	20	6	Strong..	Very fine.
105	Populus certinensis	1890	38½	18	"	Very rapid growth.
106	Populus nigra pyramidalis—*Lombardy Poplar*	1891	37	8½	"	Valuable tree.
107	Populus deltoidea aurea—*Van Geert's Poplar*	1899	3½	2	"	Very fine.
108	Potentilla fruticosa—*Shrubby Cinque-foil*	1897	4	5	Strong..	Very good.
109	Prunus pissardi—*Purple-leaved Plum*	1897	5½	5	"	Very fine.
110	Prunus Japonica flore roseo pleno	1897	3½	2½	" ..	
111	Prunus demissa—*Western Wild Cherry*	1900	4½	2½	" ..	
112	Prunus Simonii	1897	3	2	Fair....	
113	Prunus Maritima—*Beach Plum*	1901	1½	2	Strong..	Very fine.
114	Prunus Pumila—*Sand Cherry*	1899	2	2½	" ..	
115	Prunus Maximowiczii	1899	3½	2	" ..	
116	Ptelea trifoliata aurea—*Golden Wafer Ash*	1897	4	5	" ..	Very fine.
117	Pyrus Aucuparia—*European Mountain Ash*	1892	20	10	" ..	Valuable tree.
118	Pyrus Sorbus—*Service Tree*	1897	6½	3	" ..	Very fine.
119	Pyrus Japonica rosea alba—*Japanese Quince*	1898	3	2½	Fair..	"
120	Pyrus sinensis	1900	3½	3	Strong..	
121	Pyrus Maulei—*Maule's Japanese Quince*	1899	2	2	" ..	"
122	Prunus Serotina—*Wild Black Cherry*	1898	5½	5½	" ..	Very good.
123	Quercus Coccinea—*Scarlet Oak*	1897	8	4	" ..	Very fine.
124	Quercus pedunculata—*European Oak*	1892	20	12	" ..	"
125	Japan Oak	1899	2	1½	" ..	
126	Rhamnus tinctoria—*Buckthorn*	1897	5½	3	" ..	Valuable tree.
127	Rhamnus Cathartica—*Common Buckthorn*	1897	6	5	" ..	"
128	Rhus Cotinus—*Smoke Tree*	1898	2½	3	" ..	Very fine.
129	Rhus Coriaria—*Staghorn Sumach*	1897	8	5½	" ..	"
130	Rhus Cotinus atropurpurea	1899	1½	1	" ..	"

Name of Variety.	When planted.	Present height.	Diameter of head.	Character of growth.	Remarks.
		Feet.	Feet.		
131 Ribes aureum—*Missouri Currant*	1892	7½	7	Strong..	Full bloom June 5.
132 Ribes diacantha—*Siberian Currant*	1897	4	2½	" ..	Valuable.
133 Ribes aureum tenuiflorum	1898	3	3	" ..	"
134 Ribes gordonianum	1900	1½	1	" ..	
135 Robinia hispida—*Rose Acacia*	1898	3	3½	" ..	Full bloom June 15,
136 Rosa rubiginosa—*Sweetbriar*	1901	1½	1	" ..	Valuable.
137 Rosa rugosa—*Japanese Rose*	1897	3	3½	" ..	Very fine.
138 Rosa ferruginea—*Purple-leaved Rose*	1897	6	5	" ..	Very good.
139 Rosa centifolia—*Cabbage or Provence Rose*	1893	3	4	" ..	"
140 Salix alba argentea—*Silvered White Willow*	1898	5	4½	" ..	
141 Salix aurea pendula	1900	6	5	" ..	Very fine.
142 Salix rosmarinifolia—*Rosemary-leaved Willow*	1898	5	4½	" ..	
143 Salix Voronesh—*Voronesh Willow*	1900	6	5	" ..	Valuable.
144 Sambucus nigra pyramidalis—*Pyramidal Elder*	1897	4	2	" ..	
145 Sambucus nigra foliis aureis—*Golden-leaved Elder*	1897	4	4	" ..	Very fine.
146 Sambucus nigra laciniata—*Cut-leaved Elder*	1897	5½	5	" ..	Very good.
147 Sambucus nigra pulverulenta alba	1897	3½	3½	" ..	
148 Sambucus nigra fol. argenteis variegatis	1897	2½	3	" ..	Very fine.
149 Sambucus nigra fol. aureis variegatis—*Golden Elder*	1897	3	4½	" ..	"
150 Sophora Japonica	1897	6	5	" ..	"
151 Spiræa arguta	1899	4½	4	" ..	Veryfine,.
152 Spiræa callosa alba	1894	2¾	4	" ..	Very fine.
153 Spiræa vaccinifolia—*Vaccinium-leaved Spiræa*	1899	4½	2½	Fair....	Valuable.
154 Spiræa Chamædrifolia—*Germander-leaved Spiræa*	1897	4	3	Strong..	"
155 Spiræa callosa rosea	1898	3	2½	" ..	"
156 Spiræa sorbifolia	1897	2½	2½	" ..	Bloom July 20.
157 Spiræa Van Houttei—*Van Houtte's Spiræa*	1894	5½	5½	" ..	Very fine.
158 Spiræa discolor—*White-beam-leaved-Spiræa*	1897	5½	5½	" ..	Valuable.
159 Spiræa salicifolia floribus alba—*Meadow Sweet*	1897	5½	3¾	" ..	"
160 Spiræa Thunbergi—*Thunberg's Spiræa*	1897	3½	3½	" ..	Very fine.
161 Spiræa salicifolia floribus rosea—*Red-Meadow Sweet*	1897	5½	4	" ..	Valuable.
162 Spiræa callosa macrophylla	1897	5	4	Strong..	Full bloom July 15.
163 Spiræa callosa superba	1898	2	2½	" ..	Very good.
164 Spiræa japonica Bumalda—*Spiræ Bumalda*	1898	2½	2	" ..	Valuable.
165 Spiræa japonica alba—*White Japanese Spiræa*	1901	1½	1	Fair....	"
166 Spiræa bracteata aurea	1899	1½	1	" ...	Very fine.
167 Spiræa douglasi	1892	5	5	Strong..	
168 Spiræa notha	1897	4½	4	" ..	
169 Spiræa notha aurea—*Golden-leaved Spiræa*	1897	4½	4½	" ..	Very fine.
170 Spiræa japonica rubra—*Red Japanese Spiræa*	1892	2	2	Fair....	Valuable.
171 Syringa villosa	1897	6½	5	Strong..	Very fine.
172 Syringa japonica—*Japan Lilac*	1897	6	4½	" ..	"
173 Syringa josikæa—*Josika's Lilac*	1894	7½	7	" ..	Full bloom June 20.
174 Syringa vulgaris purpurea—*Common Purple Lilac*	1892	7	7	" ..	" " 8
175 Syringa vulgaris alba—*White Lilac*	1894	8	5	" ..	Very fine.
176 Syringa vulgaris Beranger	1897	3½	2	Fair....	"
177 Syringa vulgaris cœrulea superba	1897	3	2	" ...	"
178 Syringa persica laciniata—*Cut-leaved Persian Lilac*	1897	2½	2½	" ...	"
179 Syringa vulgaris nigricans	1897	3½	2½	" ..	Valuable.
180 Syringa vulgaris congo	1901	¾	.....	" ...	
181 Syringa vulgaris Gloire de Croncells	1897	3	2½	" ...	
182 Syringa vulgaris rubra insignis	1897	4	2½	Strong..	
183 Syringa vulgaris rubra plena	.....	.....	.....	....	
184 Syringa vulgaris President Grevy	1901	½	.....	Fair..	
185 Syringa persica—*Persian Lilac*	1897	3½	3½	Strong..	"
186 Syringa vulgaris Marie Legraye	1901	½	.....	" ..	
187 Syringa vulgaris Rouge de Marley	1897	3½	3	" ..	Very fine.
188 Syringa vulgaris Mathieu de Dombasle	1897	2½	2	Weak..	
189 Syringa vulgaris Lemoinei	1901	½	.....	" ...	
190 Syringa vulgaris Madame Lemoine	1901	½	.....	" ...	
191 Syringa vulgaris Chas. X	1899	2½	2	Strong..	"
192 Tamarix amurensis—*Amur Tamarisk*	1897	6½	3½	" ..	Winter kills a little.
193 Tilia platyphyllos—*Broad-leaved Linden*	1892	10	12	" ..	Very fine.
194 Ulmus Americana—*American Elm*	1891	16	12	" ..	Valuable tree.
195 Ulmus racemosa—*Cork or Rock Elm*	1894	6	3½	" ..	Valuable.

Name of Variety.	When planted.	Present height.	Diameter of head.	Character of growth.	Remarks.
		Feet.	Feet.		
196 Viburnum opulus—*High Bush Cranberry*	1891	6½	5½	Strong..	Very fine.
197 Viburnum opulus sterile—*Snow-ball*	1898	5	4½	″ ..	″
198 Viburnum Lantana—*Wayfaring Tree*	1894	8	6¾	″ ..	Valuable.
199 Viburnum prunifolium—*Black Haw*	1899	2½	2	Fair....	″
200 Vitis quinquefolia—*Virginia Creeper*	1892	......	......	Strong..	Best climber.
201 Vitis Thunbergii	1899	2½	....	Weak ..	Kills back.
Conifers.					
1 Abies subalpina	1901	1½	1	Fair....	
2 Abies balsamea—*Balsam Fir*	1893	6½	6	Strong..	
3 Abies concolor—*One Coloured Fir*	1901	3	3	″ ..	Very fine.
4 Cupressus Lawsoniana—*Lawson's Cypress*	1897	2½	4½	″ ..	Very good.
5 Cupressus pisifera—*Retinospora pisifera*	1897	3½	5	″ ..	Very fine.
6 Cupressus pisifera aurea—*Golden Retinospora*	1892	4	4½	″ ..	″
7 Cupressus pisifera filifera—*Retinospora filifera*	1894	4	5½	″ ..	″
8 Cupressus pisifera plumosa—*Plumose Retinospora*	1893	6	4½	″ ..	″
9 Cupressus pisifera plumosa aurea—*Golden Plumose Retinospora*	1898	3	2½	″ ..	″
10 Retinospora Leptoclada	1899	1½	1	Fair....	
11 Cupressus obtusa viridis—*Green obtuse Cypress*	1899	1	½	Weak ..	
12 Juniperus chinensis—*Chinese Juniper*	1898	2½	2	Fair....	″
13 Juniperus communis suecica—*Swedish Juniper*	1898	3½	2½	Strong..	″
14 Juniperus sabina—*Common Savin Juniper*	1897	1½	4	″ ..	″
15 Juniperus communis—*Common Juniper*	1894	5	4½	″ ..	″
16 Juniperus elegans—*Elegant Virginian Juniper*	1898	3½	3	″ ..	″
17 Juniperus sinensis variegata—*Variegated Savin.*	1899	1	½	″ ..	″
18 Juniperus communis aurea—*Golden Juniper*	1899	1	½	Weak ..	
19 Juniperus chinensis aurea — *Golden Chinese Juniper*	1899	1	½	″ ..	
20 Juniperus Virginiana—*Red Cedar*	1891	8	5	Strong..	″
21 Larix Europaea—*European Larch*	1890	27	16	″ ..	
22 Picea alba—*White Spruce*	1894	7½	6	″ ..	
23 Picea excelsa—*Norway Spruce*	1893	20½	11	″ ..	
24 Picea nigra—*Black Spruce*	1895	8	6½	″ ..	
25 Picea pungens—*Rocky Mountain Blue Spruce*	1892	13	8	″ ..	″
26 Picea obovata schrenkiana	1900	1	......	Fair....	
27 Picea alba variegata Aurea—*Golden White Spruce.*	1901	1	....	″	
28 Picea Parryana glauca	1900	1	......	″	
29 Picea alba variegata	1900	1	......	″	
30 Picea alba pyramidalis	1899	1	½	Strong..	″
31 Picea excelsa Remontii	1899	1½	1	″ ..	″
32 Picea alcockiana—*Alcock's Spruce*	1900	1	1½	″ ..	″
33 Pinus Cembra—*Stone Pine*	1896	4½	3	″ ..	″
34 Pinus montana Mughus—*Dwarf Mountain Pine*	1892	4½	6	Strong..	Very fine.
35 Pinus ponderosa—*Heavy Wooded Pine*	1899	2½	2	Fair....	
36 Pinus Strobus—*White Pine*	1892	10	6½	Strong..	″
37 Pinus sylvestris—*Scotch Pine*	1890	20	13	″ ..	Valuable tree.
38 Pinus Laricio nigricans—*Austrian Pine*	1894	11	9	″ ..	″
39 Pseudotsuga Douglasii—*Douglas' Spruce*	1898	5½	4	″ ..	Very fine.
40 Taxodium distichum—*Bald Cypress*	1897	2	3¼	″ ..	″
41 Thuya occidentalis—*White Cedar, Arbor-vitae*	1893	10	7	″ ..	Valuable.
42 Thuya occid. variegata—*Variegated Arbor-vitae*	1899	2	1	″ ..	Very fine.
43 Thuya occid. pyramidalis—*Pyramidal Arbor-vitae*	1897	5½	2	″ ..	″
44 Thuya occid. compacta—*Compact Arbor-vitae*	1894	4½	5½	″ ..	″
45 Thuya occidentalis globosa—*Globose Arbor-vitae*	1897	2½	2	″ ..	″
46 Thuya occidentalis Hoveii—*Hovey's Arbor-vitae*	1897	3	2½	″ ..	″
47 Thuya ericoides	1898	3	3	″ ..	″
48 Thuya occidentalis pumila	1898	2	2	″ ..	
49 Thuya occid. elwangeriana—*Elwanger's Arbor-vitae*	1897	3	4	″ ..	″
50 Thuya occidentalis vervaenana	1897	3½	3	″ ..	″
51 Thuya occidentalis Hoveii aurea—*Hovey's Golden Arbor-vitae*	1898	2	1½	″ ..	″
52 Thuya occidentalis Meehani aurea—*Meehan's Golden Arbor-vitae*	1898	2	2	Fair....	″
53 Thuya occidentalis lutea—*Yellow Arbor-vitae*	1899	¾	....	″	″
54 Thuya occidentalis pygmaea	1899	½	....	″	
55 Thuya occidentalis Columbia	1900	1	......	″	
56 Tsuga canadensis—*Hemlock*	1892	4	6	Strong..	″

STRAWBERRIES.

Experiments were conducted this season with 41 varieties of strawberries. The plots were each 99 square feet. The plants for each plot were set in the spring of 1900 in two rows, each 3 feet apart and 16½ feet long. They were set one foot apart in the rows. A space of 5 feet was left between the plots when planted so that when the runners were formed each plot was 6 feet wide and 16½ feet long of matted plants with a good space between each plot which was kept cultivated.

We seldom take more than one crop off the plants grown in the matted row system. This season, however, the fruit was picked from those plots planted in the spring of 1899. The yield, however, was not large. It was found impossible to keep the weeds out of these older plots without much extra labour, and it was thought that the fruit would not warrant the outlay, consequently the plots were allowed to remain weedy. The berries picked were small, and the yield on many did not much more than pay for the expense of picking. Some, however, yielded a fair amount of good fruit. There was no expense incurred in this instance, except that of covering the plants during winter. It seldom pays to put expense in the way of labour and fertilizers on old plots, but it is often advisable where plenty of land is available to let the plants remain for the second crop.

The land on which the main crop was grown was a clay loam, and was manured in the fall of 1899 with 20 tons of stable manure per acre. This was ploughed under in the fall, and in the spring of 1900 was worked up and complete fertilizer at the rate of 400 pounds per acre sown broadcast and harrowed in. The plants were set on the level, May 17.

The usual straw protection was not given the plants in November, and a heavy snowstorm the 5th of December covered the plants completely. This remained on until the last of March when it was thought advisable to give a light covering of straw to the new plots, but the old beds were allowed to go without protection and all came through in good condition. Notes taken on this point from year to year would indicate that only in one winter in three will the plants stand the winter without protection, and hence it is not safe to allow the plants to go without such protection.

The dates of picking and quantity of fruit obtained each day are given in the following table. The dates of picking and yield obtained from the old plots are also given. Several new varieties received from the Central Experimental Farm were added to the list this year, including Afton, P.; Nick Ohmer, B.; Clyde, B.; Senator Dunlap, B.; Glen Mary, B., and Buster, P.

STRAWBERRIES—TEST OF VARIETIES.

Name of Variety.	Sex.	Date of Picking—July.												Total Yield from plot of 99 sq. ft.	
		3rd.		6th.		9th.		12th.		15th.		20th.			
		Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.
Bisel	P	1	4	4	4	11	8	13		7	15	2	1	40	
Beverly	B	2	12	5		4	2	14	1	6	5	1		33	4
Barton's	P	3	2	6	14	6		9	4	4	12	2	2	32	2
Beder Wood	B	6		4	3	10	13	9		2	2	2	1	34	3
Brandywine	B	1		1	2	3	14	4	2	2	7	3	9	16	2
Bubach	P	9	1	9	15	11		6	2	3	6	....		39	8
Capt. Jack	B	6	1	8		5	11	4		7	8	1		32	4
Chairs	B		8	2		2	7	4	9	3	8	4	1	17	1
Crescent	P	4		8	1	5	15	7	6	5	1	1	9	32	
Enhance	B		4	3	2	3	4	7	2	6		4	1	23	13
Equinox	B	....		2		1	12	2		4	12	2		12	8
Eureka	P	....		2	1	3	7	13		5	2	1	14	25	8
H. W. Beecher	B	3	1	4	13	12	2	4		5	8	2		31	8
Haverland	P	5		4	7	9	9	7	1	7	1	1	8	34	10
Jas. Vick	B	1		5	2	9	14	9	6	4	6	4	12	34	8
John Little	B	4	1	3	7	6	9	3	15	8	2	2		28	2
Lovett	B	6	2	5	12	13	2	6		4		1		36	
Otsego	P		4	2	10	4	2	10		5	2	5	15	28	1
Paris King	B	5	5	4	11	4		1	8	2			4	17	12
Pearl	P	4	2	6	12	5	2	5	8	3	4	....		24	12
Parker Earle	P	4		3	2	7	14	7		3	2	5	15	31	1
Princess	B	7	8	6	8	7	2	4	12	3	2	1		30	
Shirts	B		4	1	8	4		3	7	6	9	1	2	16	14
Sharpless	B		12	3	8	4	6	6	8	2	2	1		18	4
Swindle	B		4	1		4	6	9	5	6	8	7	5	28	12
Seneca Queen	B		8	3		7	5	9	11	5	8	1		27	
Thompson's Late	P	9	8	4		1	6	....		....		....		14	14
Wm. Belt	B	....		....		8	2	8	1	4	5	5	4	25	12
Warfield No. 2	P	4		8	5	13	5	12	6	4	8	5		47	8
Wilson	B	3	2	4	12	8	2	6	8	7		1	12	31	4
Williams	B	2		2		8	5	4	11	2	8	1		20	8
Tennessee Prolific	B	2	2	7	12	4	12	9	8	6		1	8	31	10
Jessie	B	1		1		4	3	7	2	2	8	2	4	18	1
Ada	P	3	5	5	2	3	1	4	8	3		1		20	
Greenville	P	1	3	5	5	15	8	10		6	2	3	14	42	
Gandy	B	2		5	3	9	13	5	8	3		2	4	27	12
Cossett	P		12	5	8	4	3	3	9	3	9	......		17	9
Mary	P	1		2	12	5	2	4	6	1	12	2	8	17	8
Saunders	B	2		1	4	7	12	14	8	7		3		35	8
1001	B	2	2	1	10	4		4	8	4		6		22	4

STRAWBERRIES—TEST OF VARIETIES.

OLD PLOTS.

Name of Variety.	Date of Picking—July.										Total Yield from Plot.	
	2nd.		4th.		7th.		12th.		15th.			
	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.
Brandywine		8	1	4	2	3	....		1	2	5	1
Bisel	1	2	2	12	7	6	8	3	....		19	7
Beverly		4	2	3	4	2	7	8	....		14	1
Beder Wood	1		2	8	5	2	5	1	1	6	15	1
Barton's	1	8	3	5	6	2	4	7	1		16	6
Bubach	2	2	4	7	4	11	3	6	....		14	10
Capt. Jack	1	8	1	3	2	12	1	9	1	8	8	8
Clark's Early	1	8	1	8	1	2	1	5	....		5	7
Chairs	1	4	1		1	8	1	4	....		5	
Crescent	3		2	7	7	4	1	6	....		14	1
Enhance		8	1	4	1	8	....		....		3	4
Eureka	....		....		2	4	3	7	....		5	11
Equinox	....		....		....		1	4	2	6	3	10
Gandy	....		1	12	4		2	8	1	4	9	8
Greenville		12	1	4	4	12	3	14	....		10	10
H. W. Beecher	1	8	1	7	4	14	5	2	....		12	15
Haverland	2	1	2	3	4	6	3	1	2		13	11
Jas. Vick		12	2		6		5	8	1	2	15	6
John Little	1	8		8	2	3	....		1		5	3
Lovett	2		1	5	3	7	....		....		6	12
Otsego		4	1		7	7	6	3	....		14	14
Paris King	2	12	1		2		....		1	4	7	
Pearl	1		1	8	1	13	1	4	....		5	9
Parker Earle	1	2	1	11	....		2	14	....		5	11
Shirts	....		....		1	15	2	6	....		4	5
Sharpless	2	4	2	1	4	11	4	2	1	8	14	10
Swindle		4	3	11	2	5	2		....		10	10
Seneca Queen	1		1		4	8	4	2	....		10	10
Wm. Belt		2	1	11	2	14	5	7	1	2	11	4
Warfield	3	12	3		2	7	4	2	....		13	5
Wilson	1		3	7	2	12	1	2	....		8	5
Williams	1	8	2		2	14	2	4	1	8	10	2
Tennessee Prolific		8	2		1	8	1	6	....		5	6

GOOSEBERRIES.

The gooseberries have never made a strong growth, especially the English varieties. The soil is a heavy clay loam which dries out considerably in the summer. The gooseberry mildew which we have been able heretofore to control fairly well has this season been almost impossible to keep in check. The crop of all the English varieties, except Whitesmith and Industry, was ruined, and the yield of fruit was not large.

The English varieties of gooseberries while much larger than the American sorts are not regarded here as of much better quality, and the latter are much more vigorous here. The Red Jacket is an exceptionally fine variety. It together with Downing are two of the best sorts grown here. The Houghton is a large yielder, and the fruit is of good quality, but is small. The Whitesmith is the best of the fourteen varieties of English gooseberries tested. The common practice seems to be to pick this fruit long before it has commenced to ripen. Its quality for preserving is in our opinion greatly improved when allowed to partially ripen before picking.

EXPERIMENTS WITH GOOSEBERRIES.

Name of Variety.	Number of Plants.	Yield in 1900.	Number of Plants.	Yield in 1901.
		Lbs.		Lbs.
Smith's Improved	6	13½	6	6¾
Downing	6	15½	6	9½
Houghton	6	17	6	9¾
Red Jacket	6	16¼	6	5¾
Whitesmith	6	14½	6	4¾
Industry	6	12½	6	3¼

RED AND WHITE CURRANTS.

Eight varieties of red and two varieties of white currants fruited this season. They were grown in rows 6 feet apart and 5 feet apart in the rows. The soil on which they were grown was a heavy clay. The bushes are vigorous growers, and some of them were quite productive.

EXPERIMENTS WITH RED AND WHITE CURRANTS.

Name of Variety.	Number of Bushes.	Yield of Bushes.	Remarks.
		Lbs.	
North Star	3	13¾	Small ; fair quality.
Pomona	3	8½	Large "
Cherry	3	6¾	Very large ; fair quality.
Fay's Prolific	3	6½	" "
Red Dutch	3	16¼	Small ; fair quality.
Knight's Early Red	3	2¾	" excellent quality.
La Fertile	3	5	" "
Wilder	3	12¼	" fair quality.
White Dutch	3	10½	" "
White Imperial	3	8¾	Large "

GRAPES.

Fourteen varieties of grapes fruited this year. These were planted in the spring of 1897 on a clay loam. They were set in a row six feet apart. The vines run on a trellis made of wire attached to posts. They have always been laid down for winter, with the exception of the past winter, when they were left unprotected and came through the season in good condition. They fruited for the first time this year.

EXPERIMENTS WITH GRAPES.

Name of Variety.	When Ripe.	Colour of Fruit.	Remarks.
Florence	Sept. 23	Black	Fair quality; vigorous.
Lady	Oct. 4	White	Good quality "
Moyre's Early	" 4	Black	Fair quality; fairly vigorous.
Moyer	" 4	Bright red	Good quality; vigorous.
Telegraph	" 4	Black	" fairly vigorous.
Lindley	" 10	Red	" vigorous.
Hayes	" 10	White	" "
Worden	" 10	Black	" fairly vigorous.
Barry	" 16	"	Poor quality; vigorous.
Bacchus	" 16	"	" "
Moore's Diamond	" 16	Greenish white	Good quality; vigorous.
Herbert	" 18	Black	" "
Vergennes	" 23	Bright red	Did not ripen; vigorous.
Roger's No. 17	" 23	Blue black	" "

RHUBARB.

Five varieties of rhubarb were grown in rows six feet apart each way. The soil was a heavy clay loam and the crop is not early on such ground. The advantage in favour of a light but loamy soil for this plant is very great, as the early crop generally realizes double the price that is obtained a few days later. The plants were manured in the fall with well rotted manure which was dug in around the plants as early in the spring as possible. We have found that August is the best time for dividing and resetting roots, which should be done every four or five years.

The variety, Carleton Club, is a very large growing variety, and should be more widely known. Mitchell's Royal Albert is also very large, but late. The yield obtained from four plants was as follows:—

Name of Variety.	When Pulled.	Yield from four Plants.
		Lbs.
Paragon	May 21	22
Linnaeus	" 21	32
Victoria	" 21	24
Carleton Club	" 27	46
Mitchell's Royal Albert	June 3	21

LIME WASH FOR THE OYSTER-SHELL BARK LOUSE.

This mixture was prepared by slacking fresh lime in water and adding more water to make it of the strength desired. One experiment was made with the mixture in the proportion of 1 pound of lime to 1 gallon of water, and another with 2 pounds of lime to 1 gallon of water. The trees treated in this experiment were young, only 2 years planted, which were badly covered with the bark louse. They were in a neighbouring orchard.

The wash made of 1 pound of lime to a gallon of water was not nearly so effective as the one where 2 pounds of lime was used. On the trees where the latter mixture was used the scales were over three-quarters killed. If this is used in the fall as advised by Mr. W. T. Macoun, horticulturist of the Central Farm, there is no doubt but

that it will be still more effective. It is a cheap and efficient remedy for this troublesome pest. The spraying was done March 26, and two sprayings were given each tree on that date.

The lime should be slacked with hot water, enough being used to well cover the lime. As soon as slacked pour in cold water and stir until the whole mass is thoroughly mixed. It will need to be strained through a wire sieve before using. The mixture should be kept agitated in the barrel, and a nozzle used which by reversing can be easily cleaned. This mixture, with the addition of 15 pounds of salt per barrel, makes a good whitewash for buildings, which work can be easily done with a spray pump.

KEROSENE EMULSION FOR THE OYSTER-SHELL BARK LOUSE.

An experiment to gain information as to the value of kerosene emulsion for destroying the young lice when they have just hatched on apple trees was made in a neighbour's orchard. The work was done on young trees two years planted, which were all badly covered with the insect. Three experiments were made with this emulsion, and five trees were treated in each case.

The emulsion was made by dissolving one-half pound of hard soap in 1 gallon of rain water which was brought to the boiling point when 2 gallons of kerosene was added and churned briskly through a pump when it was quickly formed into an emulsion. Experiment No. 1 was with this emulsion diluted with water in the proportion of 1 part of the oil used to 4 parts of water (not 1 part of the emulsion to 4 parts of water). Experiment No. 2 contained 1 part of oil to 6 parts of water, and Experiment No. 3, 1 part of oil to 9 parts of water.

While this mixture proved fairly effective, yet in every case the trees were not entirely freed of the young insect. The spraying was thoroughly done, and it seems strange that some of the trees were completely cleared while some had quite a few still remaining. By giving two sprayings, one about a week after the other, this remedy has been found quite effective.

The spraying was done July 4, and notes taken later in the season. The emulsion was put on during a bright day, and no noticeable damage was done to the leaves or bark by the mixture. During a bright day the oil evaporates more quickly, and hence perhaps is not so liable to injure the tree.

TOBACCO WATER FOR THE OYSTER-SHELL BARK LOUSE.

An experiment with tobacco water was also tried on five trees in the same orchard. The solution was made by soaking 15 pounds of tobacco stems in a barrel of water 24 hours, and the liquid was used as a spray. The trees were badly covered with the insects just hatched. The spraying was done July 4. It was found that this was of little value, and the notes subsequently taken would indicate that not more than 10 per cent of the hatched insects were killed.

GARDEN PEASE.

Experiments were conducted with 84 varieties of garden pease. The object being to determine the relative value of the different kinds for early, medium and late market crops. The seed was sown on April 27 in two plots each, one row 66 feet long. The rows were 4 feet apart and the seed was planted 1½ inches deep and 2 inches apart. The marketable green pease with pods were pulled when fit for use, and the yield per plot obtained. The other plot was allowed to ripen, and the yield of ripened seed obtained.

The land on which these pease were grown was a clay loam, and was in potatoes the previous season. No barn-yard manure was used for the crop, but complete fertilizer at the rate of 100 pounds per acre was scattered along the rows before planting, and was worked in when covering the seed. The pea aphis did not trouble the crop this season.

Two new varieties were included in the test, namely, King Edward VII. and Prosperity. The former is an English variety and a large pea of excellent quality. It is a little earlier than American Wonder and Nott's Excelsior. Prosperity has a large pod and should prove a valuable market sort. The variety Gradus has not been a heavy cropper, but its quality is of the best. The varieties we would recommend, and which came in the order named for earliness are : Tom Thumb, Nott's Excelsior, American Wonder, Dwarf Telephone and Sutton's Dwarf Defiance, all dwarf varieties. Of half high sorts, Alaska, Ameer, Gradus, Carter's Up-to-Date, Duke of York, Profusion and Telegraph.

PEASE—TEST OF VARIETIES

Name of Variety.	Season of Green Peas.	Weight of Green Peas.	Height of Vine.	Length of Pod.	Size of Pea.	Yield of Ripe Seed.
		Lbs.	Inches.	Inches.		Lbs.
Gregory's Surprise	July 12 to 20	21	36	2¼ to 2¾	Medium	4¼
Station	" 12 to 20	24	30	2¼ to 2¾	"	5½
Alaska	" 12 to 20	30	30	2¼ to 2½	"	7
Extra Early	" 12 to 20	24	36	2¼ to 2¾	"	7
Thorburn's Extra Early	" 12 to 20	29	38	2¼ to 2¾	"	7
Simmers' First of All	" 12 to 20	20	30	2 to 2½	"	5¼
Cleveland's First and Best	" 13 to 22	22	36	2½ to 2¾	"	8
Tom Thumb	" 13 to 22	27	18	2¼ to 2¾	"	7¾
Extra Early Daniel O'Rourke	" 13 to 22	20	30	2 to 2½	"	5¼
Mills' First of All	" 13 to 22	23	30	2¼ to 2½	"	5
Rural New Yorker	" 13 to 22	20	30	2½ to 2¾	"	5
Early May Improved	" 13 to 22	27	38	2½ to 2¾	"	7
Ameer	" 13 to 22	32	35	2½ to 3	Large	4
Bergen Fleetwing	" 13 to 22	34	36	2¼ to 2¾	Medium	10¼
Exonian	" 13 to 22	20	27	2¼ to 2½	"	6¼
Sunol	" 13 to 22	20	32	2¼ to 2½	"	6
Early Frame Improved	" 13 to 24	22	32	2¼ to 2½	"	6¾
Philadelphia	" 13 to 24	19½	36	2¼ to 2¾	"	6½
Premium Gem	" 15 to 24	34	24	2½ to 2¾	"	8
S. B. & M. Co.'s Extra Early	" 15 to 24	34	38	2¼ to 2¾	"	9¼
Gradus	" 15 to 24	16¾	25	3 to 3½	Large	6¾
King Edward VII	" 15 to 24	22½	32	3 to 3½	"	7
Prosperity	" 15 to 24	22	30	2½ to 3½	"	7
Chelsea	" 15 to 24	33½	23	2½ to 3	Medium	6¼
Extra Early Pioneer	" 15 to 24	16¾	30	2¼ to 2½	"	6¾
Nott's Excelsior	" 16 to 25	26	18	2¼ to 2¾	"	7
American Wonder	" 16 to 25	42	16	2¼ to 2½	"	8
Extra Early Kent	" 16 to 25	32	38	2¼ to 2¾	"	7
New Maud S.	" 16 to 25	24	48	2¼ to 3	"	9¼
Early Dexter	" 16 to 25	34	36	2¼ to 2½	"	10½
Early Star	" 17 to 25	24	30	2 to 2½	"	5¾
Ringleader	" 17 to 25	22	38	2¼ to 2½	"	8¼
Hancock	" 17 to 25	22	40	2¼ to 2¾	"	9
Blue Beauty	" 17 to 26	22	24	2½ to 2¾	"	6½
Blue Peter	" 17 to 26	28	18	2¼ to 2½	"	8
Evergreen	" 18 to 26	22	32	2¼ to 2½	"	5½
Dwarf Wrinkled Sugar	" 18 to 26	25	24	2½ to 3	"	9¼
Kentish Invicta	" 20 to 29	27	42	2¼ to 2½	"	9
King of the Dwarfs	" 22 to 29	38	24	2¼ to 2¾	"	9
Carter's Up to Date	" 22 to 29	39	46	3 to 3¾	Large	9
Alpha	" 22 to 29	25	41	2 to 2½	Medium	8
Admiral	" 24 to Aug. 1	39	38	2 to 2½	Small	12
Pride	" 24 " 1	33	43	2½ to 2¾	Large	10
French Canner	" 24 " 1	34	36	2½ to 3	Small	10½

PEASE—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Season of Green Peas.		Weight of Green Peas.	Height of Vine.	Length of Pod.	Size of Pea.	Yield of Ripe Seed.
			Lbs.	Inches.	Inches.		Lbs.
Boston Wrinkled	July 24	Aug. 1	31	34	2½ to 2¾	Medium	11½
McLean's Prolific	" 24	" 1	25	32	2¾ to 3½	"	7
Duke of York	" 24	" 1	30	36	3 to 3½	Large	8½
Anticipation	" 24	" 3	37	30	2½ to 3¼	"	9½
Dwarf Telephone	" 26	" 3	44	20	3 to 3½	"	7½
McLean's Gem	" 26	" 3	50	30	2½ to 2¾	Medium	10½
Eugenie	" 26	" 3	46	40	2½ to 3	"	10½
900 to 1	" 26	" 3	46	46	2¼ to 3¼	"	9½
Pride of the Market	" 26	" 3	44	31½	2¼ to 2½	"	12½
Stanley	" 26	" 3	31	31	3¼ to 4	Large	9¼
Champion of England	" 26	" 3	35	43	2¾ to 3¼	"	10
Burpee's Profusion	" 26	" 3	43	40	2½ to 2¾	"	10½
Horsford's Market	" 26	" 3	37	36	2½ to 2¾	Medium	11
Sutton's Satisfaction	" 26	" 3	48	40	2¾ to 3	"	10¼
New Giant-Podded Marrowfat	" 26	" 3	48	32	3 to 3½	Large	13¼
Black-eyed Marrowfat	" 26	" 3	48	46	2½ to 3	"	14½
Laxton's Alpha	" 26	" 3	43	44	2 to 2½	Medium	10¾
Hair's Dwarf Mammoth	" 26	" 3	39	32	2½ to 3¼	Large	10
Abundance	" 26	" 3	38	32	2¼ to 2¾	Medium	11½
Everbearing	" 26	" 3	38	42	2¾ to 3½	Large	9¼
Schereizer's Giant	" 26	" 3	38	52	3 to 3¾	Medium	7¼
Prince of Wales	" 26	" 3	29	36	2½ to 3	Large	8¼
Startler	" 26	" 3	30	35	2½ to 3	"	11
Daisy	" 26	" 3	36	28	2½ to 3	"	10½
Sutton's Dwarf Defiance	" 26	" 3	46½	24	3 to 4	"	10¼
Melting Sugar or Edible-podded	" 26	" 5	35	53	2½ to 3	Medium	14
Profusion	" 26	" 5	44	30	2¼ to 2¾	"	9¼
Grant's Favourite	" 26	" 5	31	48	2¼ to 2½	"	10
Scimitar	" 26	" 5	50	48	3 to 3¾	Large	10½
Forty-fold	" 26	" 5	47	52	2 to 2½	Medium	12
Telegraph	" 26	" 5	46	43	2¾ to 3	Large	10
Heroine	" 27	" 5	36	34	3¼ to 4	"	9
Queen	" 28	" 5	48	34	3¼ to 4	"	11½
Juno	" 28	" 5	42	24	2½ to 2¾	Medium	10
New Victory	" 28	" 5	34	40	3¼ to 4	Large	10½
Sharp's Queen	" 29	" 5	24	36	3 to 3¾	"	8½
Duke of Albany	" 29	" 5	53	40	2½ to 3	"	14
Shropshire Hero	" 29	" 5	58	30	3 to 3¾	"	12
Veitch's Perfection	" 29	" 5	22	42	2¼ to 2¾	Medium	6
Sander's Marrow	" 29	" 5	26	40	2¼ to 2¾	"	11½

BEANS.

Thirty-two varieties of garden beans were grown to test their value for green beans and for ripening. These were planted in rows 3 feet apart, 2 rows of each 66 feet long. One plot was pulled when the string beans were fit for market, and the weights are given in the following table. The other plot was allowed to ripen its seed. The seed was planted June 3, in rows 1½ inches deep and 3 inches apart in the row.

The land was previously in pease, and received no stable manure this year. When the seed was sown complete fertilizer at the rate of 150 pounds per acre was scattered along the row and worked in when the seed was covered. The soil was a clay loam. The season was very favourable for this crop, and the bean pod spot was not so prevalent as it was last year.

Cylinder Ivory-podded Wax and Yosemite Wax are exceptionally fine golden podded varieties, but they are more liable to be attacked by the pod spot than some of the other golden sorts. The Extra Early Edible podded is a very fine extra early green pod variety. Pods of these three varieties will keep tender longer than any of the

other sorts tested. For general croppers the following are recommended:—Extra Early Edible podded, Early Long Yellow Six Weeks, Extra Early Red Valentine and Refugee, for green sorts, and Dwarf German Black Wax, Wardwell's Kidney Wax, Detroit Wax and Keeney's Rustless Wax for golden podded sorts. These come in the order named for market.

BEANS—Test of Varieties.

Name of Variety.	Dates when Pulled. Aug. 1.	Aug. 9.	Aug. 20.	Total Yield per Plot.	Colour of Pod.	Quality for String Beans.	Length of Pod.	Proportion Rusted.	Yield of ripened seed.
	Lbs.	Lbs.	Lbs.	Lbs.			Inches.		Lbs.
Currie's Rust-proof Golden Wax.	35	14¼	9	58¼	Yellow.	Fair....	3¾ to 4½	Slight.....	9
Extra Early Edible Podded......	29½	10	9	48½	Green..	Good...	3 " 4	Very slight	8
Flageolet Scarlet Wax..........	26	7¾	19	52¾	Yellow.	Fair....	4½ " 5½	" ..	9¾
Early Mohawk..................	26¼	11	18	55¼	Green..	"	4½ " 5½	" ..	8½
Early Golden Wax..............	24	10	18¼	52¼	Yellow.	Good...	3½ " 4	Slight.....	10¾
Early Black Dwarf Wax........	23	10¾	8	41¾	" ..	Fair....	3¾ " 4½	Badly......	6
Wardwell's Dwarf Kidney Wax.	22¼	6½	12	40¾	" ..	"	4 " 5	"	7½
Cylinder Ivory Podded Wax....	22	10	18½	50½	" ..	Good...	3½ " 4½	"	8¼
Rust-proof Golden Wax.........	22	8¾	15	45¾	" ..	" ...	3¼ " 4¼	Slight.....	6¾
Early Long Yellow Six Weeks..	22¼	5¼	16	43½	Green..	Fair....	4½ " 5½	"	10¼
Emperor of Russia..............	16¼	8½	12	36¾	" ..	"	4¼ " 5	None......	6
Black Eyed Wax................	14	14½	10¾	39	Yellow.	Good...	3¾ " 4¾	Very slight	6
New Golden Eyed Wax.........	14	8½	8	30½	" ..	Poor...	3½ " 4½	Badly......	6½
Yosemite Wax.................	12¼	14¼	15	41½	" ..	Good...	4½ " 5½	Slight.....	5½
Dun Colour	12	11½	6	29½	Green..	Poor...	4½ " 5¼	"	7¼
California Pea................	10¼	14	18¾	43	" .	Fair....	3½ " 4	None......	8¾
Speckled Wax..................	6¼	13½	24	43¾	Yellow.	"	4½ " 5¼	Slight.....	9
Fame of Vitry..................	......	30¼	25	55¼	Green..	"	6 " 6¾	None......	9¾
Early China....................	......	28¾	4	32¾	" ..	"	4 " 5¾	Very slight	8
New Triumph...................	......	28½	18	46½	" ..	Poor...	4½ " 5	None......	10
New Stringless.................	......	27	6¾	33¾	" ..	Good...	4 " 4¾	Slight.....	10
Extra Early Red Valentine......	......	26	22¼	48¼	" ..	Fair....	3¾ " 4½	Very slight	10¼
Early Large White Marrowfat..	......	24¼	12	36¼	" ..	"	3¼ " 4	" ..	10
Royal Dwarf Kidney............	......	22	23½	45½	" ..	"	5 " 6½	" ..	10½
Keeney's Rustless Wax.........	......	22¼	15	37¼	Yellow.	Good...	3¼ " 3¾	None......	6¾
Faber's I. X. L.................	....	22¼	14	36¼	Green..	Fair....	4½ " 5	Very slight	9¼
Canadian Wonder..............	.....	16¼	28	44¼	" ..	"	4½ " 5½	None......	11¼
Black Speckled Wax...........	.....	16	28¼	44¼	" ..	"	5½ " 6	"	8
Detroit Wax....................	......	16	14¼	30¼	Yellow.	"	3½ " 4¼	Slight.....	8
Rogers Lima Wax...............	....	8¾	45	53¾	" ..	"	3½ " 4	None......	9
Early White Seeded	......	8½	32½	41	Green..	"	3 " 3¼	Very slight	7½
Refugee........................	......	......	36¼	36¼	" ..	"	4½ " 5	None......	5

BEANS FERTILIZED AND NOT FERTILIZED.

To gain information as to the value of an application of complete fertilizer to hasten the bean crop for early market, three varieties of beans were sown in duplicate rows, one row of which was fertilized at the rate of 200 pounds per acre scattered along the row covering a space of 6 inches wide which was raked in before seeding. The other row received no fertilizer. Drills were made 1½ inches deep, and the seed placed 2 inches apart and covered. The seed was sown June 3. The land was similar to that on which the other beans were grown. The weights as given below were obtained in each case from 1 row 66 feet long. There were also duplicate plots which were allowed to ripen their seed. There is apparently a marked difference in favour of using fertilizer to hasten the crop for early market.

Name of Variety.	Fertilized.	When Pulled and Yield.			Total Yield from Plot.	Ripe seed per Plot.
		Aug. 3.	Aug. 9.	Aug. 20.		
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Dwarf German Black Wax	Yes.	22¼	2	2¼	26½	6¼
" "	No.	12	5½	2	19½	5¾
Detroit Wax	Yes.	14¼	16¼	11¾	42¼	9½
"	No.	2	24½	10½	35	6¾
Long Yellow Six Weeks	Yes.	20	21¾	6	47¾	8¾
" "	No.	4¼	20½	2	26¾	7¾

ONIONS.

Eighteen varieties of onions were sown in a hot-bed March 25, in rows 3 inches apart and three-quarters of an inch deep. The seed was scattered so that from 10 to 12 seeds occupied an inch of row. These made good growth, with the exception of Prizetaker, which variety failed to germinate. The plants were transplanted to the open ground May 11. At this time they were about one-half the size of a lead pencil.

The land had previously been in garden crops, and was in a fairly good state of fertility. It was manured in the fall of 1900 with 20 tons of stable manure per acre, which was ploughed under. This was worked up in the spring and the land run into rows 30 inches apart. These rows were raked off and fertilized at the rate of 400 pounds per acre with complete fertilizer, which was raked in on top of the levelled rows. Two rows of onions were set to each marked row, placed 6 inches apart, and the plants were set 3 inches apart in the rows. The soil was a clay loam.

The distance generally advised for onions is in rows 12 inches apart on level ground, and 3 inches apart in the rows. The plants were set three-quarters of an inch deep in the ground. If the soil is light they would do better if planted still deeper.

If the onion seed is to be started in the open ground the land should be worked up as early in the spring as possible. The earlier the seed is in the better. If grown in this way the Bartletta and Extra Early Flat Red have been the best sorts tested here for that method of culture. Few varieties of onions have done well here from seed sown in the open ground. The season is too short and they do not mature properly. The transplanting takes very little more time than thinning the plants which is necessary when the seed is sown in the field. No plant is more easily transplanted than the onion, and the plants can be set any time after the first of May.

The onion grows best on a soil previously well enriched, and having an abundant amount of available plant food. The manure if applied in the spring should be well rotted and thoroughly worked into the surface soil. The best practice is to manure in the fall and continue growing this crop on the same ground for several years.

The first four named sorts in the list which follows are early white varieties. The Mammoth Silver King is a very large growing white onion, maturing early. The Prizetaker has previously been tested, and ranks as one of the best for transplanting and for general crop. The Yellow Globe is also a splendid sort for this purpose. Onions should be gathered as soon as the crop is matured, or when the most of the necks have withered and turned yellow. The white onions if not pulled and stored when matured are liable to turn green, which lessens their value very much.

The onions should first be allowed to dry for a week or ten days in piles in the field. If the weather is not favourable, as is often the case here, they should be spread on the floor of an outbuilding until thoroughly cured. They keep best in a dry, cool cellar with the temperature just above the freezing point. They should be cured with the

tops on, and will keep well in this condition, and topping can be done when they are prepared for the market.

The yield of the different varieties as given below is from one row 33 feet long. The varieties are given in the order of their earliness.

ONIONS—TEST OF VARIETIES.

Name of Variety.	Date when Pulled.	Yield of Row 33 ft. long.
		Lbs.
Paris Silverskin	Sept. 2	33½
Barletta	" 2	29½
New Queen	" 2	24½
White Dutch	" 2	30½
Extra Early Flat Red	" 11	18¼
Wethersfield Large Red	" 11	20¾
Southport White Globe	" 11	14¾
Mammoth Silver King	" 11	38½
Australian Brown	" 11	29¼
Blood Red	" 11	32½
Straw-coloured Spanish	" 11	34½
Market Favourite Keeping	" 11	26½
Southport Yellow Globe	" 11	40
James' Keeping	" 11	23
Trebon's Large Yellow	" 11	29
Golden Globe	" 11	17¼
Danver's Yellow Globe	11	25½

CABBAGE.

Twenty-three varieties of cabbage were grown in the test plots. The object of the experiment was to obtain information as to the value of the different sorts for early market purposes. The seed was sown in a hot-bed April 13, in rows 4 inches apart. The plants were thinned to one inch apart in the rows on April 25, and were set in the open ground May 15. The glass should remain off the hot-beds for 10 days before putting the plants out to harden them up. The plants should be given plenty of room in the hot-bed and not too much water.

The soil in which the plants were set was a heavy clay loam, which was manured in the fall of 1900 with stable manure at the rate of 20 tons per acre. This was ploughed under, and the following spring was worked up and run into rows 30 inches apart. The rows were raked off and the plants put out. On May 30, a tablespoonful of nitrate of soda was scattered on the soil around each plant, covering a space of about 5 inches in diameter. Nitrate of soda supplies nitrogen in a readily available form, giving the plants a vigorous start. They made good growth at the beginning, but owing to the exceptionally dry weather they did not produce large heads.

The cabbage root maggot did not give any trouble this season, and seems to have entirely disappeared. The cabbage worm *Pieris rapae* is increasing, and is found to be a very troublesome pest.

Twenty plants of each variety were set in rows 30 inches apart, and 24 inches apart in the rows. The yield has been calculated from the produce of one row 33 feet long, there being 16 plants in this area. These were cut and weighed August 18 and 29. The following table gives the varieties in the order of their earliness. Heads of some of the varieties were fit for market before the 18th, and many of the later sorts were not fully developed.

It was found that Flat Parisian, very early; Express and Early Spring, early; and Vandergaw, later, were the best of all the sorts tested.

CABBAGE—TEST OF VARIETIES.

Name of Variety.	Aug. 18.		Aug. 29.		Total Number of heads pulled.	Total Weight of heads.
	Number of heads pulled.	Weight of heads.	Number of heads pulled.	Weight of heads.		
		Lbs.		Lbs.		Lbs.
St. John's Day	12	21¼	4	7¾	16	29
Paris Market	8	19½	8	23¼	16	42¾
Flat Parisian	12	31¼	4	11	16	42¼
Jersey Wakefield	10	29½	6	18½	16	48
Express	11	23¾	5	13¼	16	47
Early Spring	11	25½	5	10½	16	46
Etampes	9	25¼	7	17¾	16	43
Earliest of All	9	21	7	16¾	16	37¾
Imp. Early Summer	8	24½	8	22	16	46½
Early Summer	7	17½	9	19½	16	37
Early Flat Dutch	7	21	9	27½	16	48½
Earliest White Giant	7	19½	9	26	16	45½
Winningstadt	7	15¾	9	23½	16	39¼
Vandergaw	7	18½	9	23½	16	42
Burpee's All Head	6	17	10	29½	16	46½
All Seasons	4	12	12	33½	16	45½
Succession	4	9¾	12	27½	16	36½
Dwarf Savoy	4	10½	12	23	16	33½
Green Globe Savoy	3	7	13	25	16	32
Fottler's Brunswick	2	7	14	44½	16	51½
Surehead Improved	2	6	14	40½	16	46½
Premium Flat Dutch	2	6½	14	43	16	49½
Marblehead Mammoth	2	6¼	14	39½	16	45¾

CAULIFLOWER.

Eight varieties of cauliflower were tested on land similar to and receiving the same preparation as that on which the cabbages were grown. The seed was sown in the hot-bed April 9, and transplanted to another hot-bed April 25 in rows 3 inches apart, and 2 inches apart in the rows. They were planted in the open ground May 15, in rows 30 inches apart, and 20 inches apart in the rows. The yield given in the following table was from one row 33 feet long, there being 20 plants in that length of row. Twenty-five plants were set of each variety.

The first heads of the early varieties were very good, especially the Early Snowball and Extra Early Whitehead, but the season becoming very dry the remainder of the heads were not well formed. The Nonpareil, formerly tested here, and considered a good sort was poor this season, forming but few good compact heads. This was probably due to the dry weather. The Half Early Paris was very poor. The Large Late Algiers gave some good heads later in the season.

The cauliflower plant requires a good, deep, rich loam, retentive of moisture, as the heads do not fill out well and compact unless well supplied with water.

The root maggot did not trouble any of the plants. Nitrate of soda applied at the same time and in similar manner to that used on the cabbages proved valuable in giving a quick vigorous early growth to the cauliflowers.

Name of Variety.	Cut July 20.		Cut July 26.		Cut Aug. 5.		Total Yield.		Character of Head.
	Number of Heads.	Weight of Heads.	Number of Heads.	Weight of Heads.	Number of Heads.	Weight of Heads.	Number of Heads.	Weight of Heads.	
		Lbs.		Lbs.		Lbs.		Lbs.	
Early Snowball..................	8	14	10	20	2	3¼	20	37¼	Good.
Gilt Edge....	10	14½	6	7¼	4	3	20	24¾	Fair.
Extra Early Selected Erfurt.........	9	10½	7	9½	4	3¼	20	23¼	"
" Whitehead	8	15½	8	11¾	4	5¼	20	32½	Good.
" Paris or Nonpariel......	5	7½	6	7¼	9	9¾	20	24½	Fair.
Half Early Paris	......	......	......	......	13	13½	13	13½	Poor.
Chambourcy's Mammoth............	......	......	......	......	15	22¾	15	22¾	Very poor.
Late Algiers,.........	......	......	......	......	2	2¼	2	2¼	Good later.

TOMATOES.

Experiments were conducted this season with 48 varieties of tomatoes. The seed was sown in a hot-bed March 25, in rows 3 inches apart. The plants were thinned to one inch apart in the rows when quite small, and on April 16 were set, one plant to a strawberry box filled with soil. These boxes were put close together into another hot-bed on about 1 inch of soil and remained there until put out in open ground on June 8.

The tomato plant likes plenty of heat, and growth is vigorous if proper conditions are given. The plants, however, should have sufficient ventilation to make them stocky and thrifty, and after the middle of May the glass should be left off the hot-bed as much as possible. When grown in strawberry boxes the earth soon dries out, making frequent watering necessary. The plants were put in the open ground in rows, 4 feet apart each way. The boxes in which the plants were grown were taken to the field and cut so that the plants with the earth attached could be taken out and placed in position without checking growth.

The land on which these plants were put was previously in millet, and received no barn-yard manure for the tomato crop. After the plants were out a week a handful of nitrate of soda was scattered around each plant just before a rain. This proved very beneficial and gave a vigorous early growth not obtained in any other way.

The varieties of rough and irregular growth are not as suitable for market as the smoother sorts, and some of the earliest ripening varieties are of this character. Some, however, of the smooth sorts ripen the bulk of their crop about as early as many of the wrinkled ones. Of the wrinkled sorts the earliest of all, Early Richmond and Early Conqueror are recommended. The last named sort is developing into a much smoother fruit than formerly, and splendid market specimens were obtained from some plants of this variety. The varieties recommended for market and general use are Early Ruby, Atlantic Prize, Fordhook's First, Dwarf Champion, and New Stone.

The quantity of fruit obtained from four plants of each variety is given in the following table. The balance of the fruit not ripened was picked September 10.

TOMATOES—EXPERIMENTS WITH VARIETIES.

Name of Variety.	Date of Early Pickings, and Yield of Ripe Fruit. Aug. 19.		Aug. 27.		Aug. 31.		Total Yield from 4 plants of Ripe Fruit.		Total Yield from 4 plants of Green Fruit.		Total Yield from 4 plants.		Size and Character of Fruit.
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	
Earliest of All	3	4	5	15	6	4	26	7	14	2	40	9	Small rough.
Early Conqueror	1	15	8	9	14	..	32	8	16	..	48	8	Medium smooth.
Acme	1	8	3	4	5	1	14	9	22	..	36	9	"
Livingston's Perfection	1	7	4	9	6	7	24	..	16	..	40	..	Large smooth.
Early Ruby	1	4	16	6	10	8	41	14	14	2	56	..	Medium smooth.
Brinton's Best	..	11	2	8	7	9	21	10	30	..	51	10	"
Matchless	..	11	3	14	4	..	19	13	12	..	31	13	Large smooth.
Early Bermuda	..	10	3	8	3	12	13	8	18	..	31	8	Large rough.
Mikado	..	9	2	4	4	12	13	9	22	..	35	9	Medium smooth.
Improved Trophy	..	9	1	2	4	12	15	7	45	8	60	15	"
Mitchell's No. 1	..	8	1	8	3	2	9	10	35	..	44	10	Large rough.
Money Maker	..	7	4	3	7	10	23	4	49	..	72	4	Large smooth.
Early Richmond	..	6	5	2	6	9	28	9	16	9	45	2	Large rough.
Beauty	..	5	1	10	4	9	14	..	31	..	45	..	Medium smooth.
Early Bird	..	4	3	5	7	11	31	4	20	10	51	14	"
Potato Leaf	..	4	4	8	3	10	15	6	20	..	35	6	Large smooth.
New Stone	..	2	..	8	3	..	10	10	28	..	38	10	"
Favourite	..	2	1	11	2	2	9	..	32	..	41	..	"
Mayflower	..	..	6	4	4	14	20	2	16	..	36	2	Medium smooth.
Ponderosa	..	..	4	12	2	4	13	..	50	..	63	..	Very large rough.
Ignotum	..	..	4	12	5	4	18	8	45	..	63	8	Large smooth.
Crimson Cushion	..	..	4	7	5	2	10	7	24	..	34	7	Large rough.
Atlantic Prize	..	..	4	6	6	2	21	8	35	..	56	8	Medium smooth.
Canada Victor	..	..	4	6	5	1	18	6	27	..	45	6	"
Royal Red	..	..	4	4	4	1	18	7	37	..	55	7	Large smooth.
Volunteer	..	..	4	..	4	8	14	8	37	8	52	..	"
Comrade	..	..	3	12	3	2	17	6	32	..	49	..	Medium smooth.
Lorillard	..	..	3	5	8	..	18	..	40	..	58	1	"
New Enormous	..	..	3	4	4	9	23	3	42	..	65	3	Large rough.
Democrat	..	..	3	..	4	7	12	7	45	9	58	..	Medium rough.
Aristocrat	..	..	2	8	4	12	12	12	43	7	56	3	Medium smooth.
New Everbearing	..	..	2	8	3	9	9	9	31	6	40	15	"
Potomac	..	..	2	6	4	12	20	8	37	8	58	..	"
Bond's Early Minnesota	..	..	2	4	4	6	17	10	41	..	58	10	"
Conference	..	..	2	4	9	6	20	10	20	..	40	10	"
Greekside Glory	..	..	2	3	7	10	18	1	33	..	51	1	Large rough.
Baltimore Prize Taker	..	..	2	2	6	12	14	14	37	2	52	..	Medium smooth.
Maule's New Imperial	..	..	2	1	2	9	22	2	38	..	60	2	Large smooth.
Imperial	..	..	2	..	8	..	26	..	40	6	66	6	"
Fordhook's First	..	..	2	..	8	12	16	12	28	..	44	12	"
Buckeye State	..	..	1	13	3	4	18	..	40	..	58	..	"
Waldorff	..	..	1	12	3	8	14	4	18	..	32	4	Small smooth.
Large Red Perfection	..	..	1	8	1	14	9	6	34	..	43	6	Large rough.
Thorburn's Long Keeper	..	..	1	..	1	10	9	10	28	..	37	10	Large smooth.
Honor Bright	..	..	..	12	1	10	18	2	32	..	50	2	"
Golden Queen	..	..	..	10	3	14	14	..	37	10	51	10	"
Table Queen	..	..	..	10	5	8	13	2	25	..	38	2	"
Fordhook's Fancy	..	..	..	..	3	1	11	2	21	..	32	2	Small smooth.

CORN.

Twenty varieties of garden corn were tested. The seed was sown June 5, on the level, in rows 3 feet apart, and the plants were thinned to 10 inches apart in the rows. The land was in garden pease the previous season, and was of a sandy loam character. It was ploughed in the spring and worked up. No barn-yard manure was used, but complete fertilizer at the rate of 500 pounds per acre was sown broadcast and harrowed in with the smoothing harrow. The horse cultivator was run through the rows at intervals of 10 days during the summer.

The season was very suitable for the corn plant. The continuous warm weather matured the crop early, and varieties that have never before eared sufficiently for market produced a fine crop. The yield was calculated in each case from the product of one row 33 feet long. The following table gives the date of pulling, number of ears and weight of crop. The variety, Peep-O'Day, was the earliest variety grown. The best varieties as to quality were Crosby's Early, Early Marblehead and Early Minnesota. The Metropolitan, New Champion and Nonesuch are excellent sorts for main croppers.

EXPERIMENTS WITH CORN.

Name of Variety.	When Pulled.	Number of Ears.	Weight of Ears.	Length of Ears.
			Lbs.	Inches.
Peep O'Day	Aug. 29	50	23	5½ to 6
Ford's Early Sugar	" 29	56	25	5½ " 6½
First of All	" 29	50	27	6 " 7
Red Cory	Sept. 2	40	20½	6½ " 7
White Cory	" 2	42	28	6½ " 7
Adams' Extra Early	" 2	46	24	6 " 6½
Early Marblehead	" 2	40	23	6½ " 7½
Crosby's Early	" 12	42	17½	6 " 6½
Mammoth White Cory	" 12	40	18¼	5½ " 6
Early Minnesota	" 12	52	28	6 " 7
Metropolitan	" 12	40	33	6½ " 7½
New Champion	" 12	46	37	7 " 8
Nonesuch	" 15	40	34	6¾ " 7½
Earliest Sheffield	" 15	44	26	6 " 6½
Old Colony	" 17	40	34	6½ " 7½
Moore's Early Concord	" 17	40	29	6½ " 7
Perry's Hybrid	" 19	48	36	6 " 7
Hickox Improved	" 19	40	36	6½ " 7
Canada Yellow	" 19	42	19	6 " 7½
Early Giant	" 22	48	40	6 " 6½

CORN WITH SUCKERS REMOVED AND NOT REMOVED.

Three varieties of corn sown at the same time, fertilized in the same manner, and given similar cultivation to that of the other corn plots, were grown to test the result of removing suckers from the corn plant in hastening maturity. The suckers were removed from one row of 33 feet July 20, and one row was left without being removed. No advantage was apparently gained by removing the suckers. The crop was pulled August 27, and the yield obtained was as follows:—

Name of Variety.	Suckered.		Not Suckered.	
	Number of Ears.	Weight of Ears.	Number of Ears.	Weight of Ears.
		Lbs.		Lbs.
Peep O'Day	38	14	34	13
Red Cory	24	11	34	18
First of All	24	12	30	17

PARSNIPS.

Six varieties of parsnips were sown May 16, in rows 30 inches apart. The land was previously in potatoes, and was a heavy clay loam. Barn-yard manure at the rate of 20 tons per acre was spread and ploughed under in the fall of 1900. The land was ploughed and worked up in the spring of 1901, and the rows run. The yields given are from 1 row 66 feet long. The Early Round is a short parsnip of good quality for early use. The Guernsey is a half long sort, which is very desirable. The Hollow Crown is probably the best for general crop, and is of excellent quality.

Name of Variety.	Yield from Plot.	Character of Root.
	Lbs.	
Guernsey	89½	Medium long.
Cooper's Market	88¼	"
Hollow Crown	72¾	Long.
Elcombe's Giant	72½	"
Student	69½	Medium long.
Dobbie's Selected	65	"
Early Round	52	Short.

BEETS.

The land on which the beets were grown was of similar character, and the preparation the same as that on which the parsnips were grown. The yields given below were obtained in each case from one row 66 feet long.

Name of Variety	First fit to use.	Yield of Plot.	Remarks.
		Lbs.	
Extra Early Dark Red Flat	July 22	93	Small, short.
Extra Early Blood Red Turnip	" 25	108	Medium, short.
Nutting's Dwarf Improved	Aug. 15	98	Medium, half long.
Dell's Blood Leaf	" 15	78	Small, half long.
Long Smooth Blood	" 15	134	Large, long.

WATER MELONS.

Four varieties of water melons were started in a hot-bed by planting seeds May 4, in strawberry boxes filled with loam. One foot of horse manure was used in this hot-bed and a moderate bottom heat obtained. It is not necessary to have much heat at this time of year for if forced the plants tend to have a weak and slender growth.

The bed was kept well ventilated, and the plants were gradually hardened off by removing the glass entirely 10 days before setting them out. They were removed to the open ground June 10. Two plants were allowed to a box, and two boxes were set to a hill, and the hills were made 5 feet apart each way. The boxes were cut and the ball of earth removed with the plants so that no check was given to their growth.

The hills were fertilized with complete fertilizers. The soil was a light loam and was previously in millet, and no manure was used after that crop was removed.

Specimens from all of the varieties ripened. The crop was not heavy and the melons did not grow large, but were of excellent quality. The varieties Peerless, Stoke's Early, Cole's Early, and Vick's Early were grown. For earliness they come in the order named. The Peerless was the finest of the sorts tested.

CUCUMBERS, SQUASH AND PUMPKINS.

Thirty-two varieties of cucumbers. Twenty-four varieties of squash and five varieties of pumpkins were grown on land of similar character to that on which the water melons were grown. Owing to the dry weather the crop was small, but the quality of the squash was above the average.

The White Spine and Boston Pickling cucumbers were the best varieties for general market and pickling purposes. The Bay State and Early Marblehead are two squashes worthy of special mention. The quality of these was exceptionally fine, especially the Bay State. The Hubbard and Essex Hybrid were the two best winter sorts tested.

SPINACH.

Several varieties of spinach were tested. The ground was prepared in a similar manner to that on which the parsnips were grown. The seed was sown in rows 28 inches apart on May 16. The Victoria was the best of the sorts tested, and was fit to use June 22. This plant makes excellent 'greens,' and is of the easiest culture.

EXPERIMENTS WITH EARLY POTATOES.

Eight varieties of early potatoes were planted to test their relative earliness when fertilized in different ways. One-half of a plot of ground was manured in the spring with 20 tons of stable manure per acre. The other half had no manure. The land was ploughed and worked up, and run into rows 28 inches apart. Two rows of a variety were planted through this strip thus making one-half of them manured and one-half not manured. Every other row was fertilized at the rate of 500 pounds of potato fertilizer per acre, which was scattered along the rows and covered with the potatoes. The land was a heavy clay loam, and suffered greatly from the dry season, the crop being very poor.

The first digging was made August 19, to find out what varieties would give the best results at that date. Strips 33 feet long were dug across each set of plots, and the potatoes gathered from each row. The yield given in the following table is from 1 row 33 feet long:—

Name of Variety.	Dug August 19.							
	Not Manured.				Manured.			
	Fertilized.		Not Fertilized.		Fertilized.		Not Fertilized.	
	Marketable.	Not Marketable.	Marketable.	Not Marketable.	Marketable.	Not Marketable.	Marketable.	Not Marketable.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Irish Cobbler....................	25½	6½	18½	4	24	6	19	3½
Burpee's Ex. Early..............	22½	3½	24½	3	18½	5½	15	4
Bovee...	20	6	12	8½	19	6	10½	5½
Early Sunrise...................	17	8½	9	6½	20¾	5½	14	5½
Crown Jewel.....................	22½	7	9	5	24½	4	14½	3
Early Gem.......................	12	8	9	5½	17	7½	14	6½
Pearce's Ex. Early..............	11	6	10	5	21	4	14½	5½
Early Ohio...	12	6	9	6½	16½	7	11	4½

Name of Variety.	Dug October 4.							
	Not Manured.				Manured.			
	Fertilized.		Not Fertilized.		Fertilized.		Not Fertilized.	
	Marketable.	Not Marketable.	Marketable.	Not Marketable.	Marketable.	Not Marketable.	Marketable.	Not Marketable.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Irish Cobbler....................	34	6	15	6	21	6	19	6
Burpee's Ex. Early	19	9	16	8	27	8	12	4
Bovee............................	22	8½	9½	4½	25	7	18	6
Early Sunrise..................	16	7½	12	5	19½	6	14½	6½
Crown Jewel.....................	26	7½	10	6	24½	8	21½	8½
Early Gem....	16	6	7½	6	19	11½	14	11½
Pearce's Ex. Early..............	17	9	12	7	17	9½	16½	10
Early Ohio.................. .	16	9	10	8	22½	8	14	10½

MEETINGS ATTENDED.

I attended the annual meeting of the Nova Scotia Fruit Growers' Association at Wolfville, N.S., January 28 and 29. I also addressed agricultural meetings at the following places:—

January 15.—Collingwood, N.S.
" 16.—Wallace Bridge, N.S.
" 17.—Upper Malagash, N.S.
" 18.—Tatamagouche, N.S.
" 19.—River John, N.S.
" 21.—Earltown, N.S.
" 22.—Central New Annan, N.
" 23.—Wentworth, N.S.
January 24.—Great Village, N.S.
" 25.—Bass River, N.S.
" 30.—Bridgetown, N.S.
March 1.—Kingston, N.B.
" 4.—Berwick, N.B.
" 5.—Jeffrey's Corner, N.B.
June 19.—East Amherst, N.S.

I have the honour to be, sir,
Your obedient servant,

W. S. BLAIR,
Horticulturist.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF S. A. BEDFORD, SUPERINTENDENT.

BRANDON, MAN., November 30, 1901.

To DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my fourteenth annual report, with details of experiments undertaken and work accomplished on the Brandon Experimental Farm during the past year.

The past winter was unusually mild. Snow fell early and the ground was completely covered until spring, but owing to the absence of severe wind storms there were very few drifts.

Spring opened about the average date, the first seeding being done at the Experimental Farm on the 8th of April, but on the 15th of April there was a heavy snow storm which delayed seeding for a week. After this date the weather was favourable and seeding was finished by May 16.

During the latter part of May the weather was unusually hot and dry, so much so that in a few instances young plants were completely killed.

On June 6, there was a heavy fall of wet snow. The growing grain was completely covered, while trees and shrubs were bent to the ground and in many instances severely injured.

On the night of the 7th of June, there were six degrees of frost, which severely injured both wild and cultivated fruits.

The rainfall in June was above the average and the growth of grain rank, but very soft and favourable to the spread of rust.

July was quite favourable for the growing crop, and August was dry and free of frost.

September and the early part of October were very showery and unfavourable for stacking and threshing, and much of the wheat became badly bleached, but the yield of all kinds of grain was largely above the average in nearly every part of the province, and the country has produced much the largest crop of grain in its history.

EXPERIMENTS WITH SPRING WHEAT.

Perhaps the most important feature, this year, in connection with this, our most valuable grain, is the remarkably uniform excellence of the crop throughout the province. In no portion of the country has the crop been a failure, and in nearly all parts the yield has been above the average. In addition to this the area sown is larger than usual, these two features combining to make it the largest crop of wheat grown in the country.

Owing to the rank growth of straw and the unfavourable weather, the crop was unusually expensive to harvest and thresh, and it is feared that a considerable portion of it, in some districts, will remain in the stack all winter.

On the Experimental Farm the yield of wheat was generally above the average, the only exceptions being the varieties particularly subject to rust, some of these gave a very poor yield of shrivelled grain.

Among the varieties tested this year, for the first time, are a number from Australia. These were, with one exception, badly rusted and the yield was small. Australian No. 13 had good clean straw and was quite productive, but the kernel was small and light. The heads of all the Australian varieties were large, and it is possible that they may compare more favourably in a dry year.

Four interesting varieties were received from the Minnesota Experiment Station. These had long but open heads and none of them equalled the Red Fife in productiveness.

The Goose wheat is again near the head of the list. It was the only variety perfectly free of rust, the straw remaining clean and bright all through the wet harvest weather. The grain is very flinty and not marketable here.

Four of the cross-bred varieties, originated at the Experimental Farms, have this year surpassed the Red Fife for productiveness. One of these, 'Crown,' is also second on the list of the best twelve varieties for the past five years.

There was a remarkable absence of smut in the wheat this year. This is particularly fortunate for had it been otherwise, the wet harvest and threshing season would have very thoroughly distributed the spores, greatly injuring the sample.

Owing to the unfavourable weather during the latter part of the season, most of the grain will grade No. 1 and No. 2 Northern.

About half an acre each of fall wheat and rye were sown during the month of August last. The plants became firmly rooted and were from four to six inches high when winter set in.

Seventy-two varieties of spring wheat were tested this year. They were all sown on the second and third of May, on a sandy loam soil, in plots of one-twentieth of an acre each.

WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Speltz	Aug.	18	108	42	Very weak	2½	Bearded	4,600	45	20	39½	Slightly.
Goose	"	23	112	46	Stiff		"	4,820	42	..	62	None.
Crown	"	17	106	48	Fair	3½	"	5,020	38	..	59½	Slightly.
Admiral	"	19	108	50	Stiff	3½	Beardless	4,700	37	20	59½	Badly.
Progress	"	17	106	50	"	3½	"	3,180	37	..	60	"
Clyde	"	13	102	48	Fair	3½	"	4,540	36	40	59½	"
Red Fife	"	22	111	51	Stiff	3	"	5,140	36	40	60	Slightly.
Monarch	"	20	109	48	"	3	"	5,220	36	20	59½	"
White Russian	"	22	111	46	"	3	"	5,880	36	..	58½	"
Stanley	"	17	106	51	"	3	"	5,080	36	..	59½	"
Australian No. 13	"	22	111	46	"	3	"	6,120	36	..	58½	"
Vernon	"	20	110	44	Weak	2½	Bearded	6,360	35	40	59	"
Roumanian	"	22	112	50	"	3	"	4,700	35	40	62	"
Beauty	"	20	109	47	Fair	3	Beardless	5,300	35	40	58½	"
Huron	"	18	107	46	Stiff	3	Bearded	4,720	35	20	59	Badly.
Alpha	"	14	103	45	"	3	Beardless	5,640	35	..	59	"
Laurel	"	22	111	46	"	3½	"	6,040	35	..	56	Slightly.
Norval	"	11	101	45	Fair	2½	Bearded	5,320	34	40	59½	"
Wellman's Fife	"	20	109	48	Stiff	3	Beardless	5,060	34	40	59½	Badly.
White Fife	"	20	109	42	"	3½	"	5,380	34	20	60	"
Advance	"	14	103	48	Fair	3	"	5,180	34	20	59	Slightly.
Minnesota No. 163	"	22	111	44	Stiff	3	"	6,100	34	..	59	Badly.
White Connell	"	22	111	46	"	3	"	5,400	34	..	59¼	Slightly.
Minnesota No. 149	"	22	112	46	"	3½	"	5,620	33	40	59½	Badly.

WHEAT—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Dawn	" 12	101	41	Fair	3	"	4,440	33	20	59½	Badly.
Benton	" 14	103	39	"	2½	"	4,080	33	20	58½	"
Rio Grande	" 17	107	53	Stiff	3½	Bearded	6,220	33	..	60	"
Campbell's White Chaff	" 19	108	47	"	3	Beardless	3,640	33	..	59	"
Rideau	" 16	105	45	"	2½	"	3,760	33	..	59	Slightly.
Minnesota No. 169	" 20	111	49	Fair	3½	"	6,240	32	40	59	"
Blenheim	" 17	106	49	Stiff	3	Bearded	5,460	32	20	58	"
Blue Stem	" 25	114	51	Fair	3½	Beardless	4,900	31	40	57¼	Badly.
Weldon	" 22	111	44	Stiff	3	"	5,840	31	40	59	"
Colorado	" 17	106	50	Fair	3½	Bearded	6,420	31	20	59	Slightly.
Plumper	" 20	110	44	Stiff	2½	"	4,120	31	20	60	"
Mason	" 16	105	43	"	3	Beardless	3,680	31	..	61	Badly.
Preston	" 17	106	50	"	3	Bearded	4,940	31	..	58½	"
Byron	" 17	107	49	"	3	"	4,160	30	40	58½	"
Angus	" 16	106	48	"	4	Beardless	5,040	30	40	48	Consid'rably
Dufferin	" 14	103	45	Fair	3	Bearded	3,860	30	40	59	Slightly.
Blair	" 22	112	47	Weak	3	Beardless	5,920	30	20	59½	"
Australian No. 9	" 20	109	46	Fair	3	"	5,680	30	..	58	Badly.
Hungarian	" 20	109	42	"	2½	Bearded	4,660	29	40	59½	Slightly.
Pringle's Champlain	" 16	106	40	"	3	"	6,340	29	20	58	"
Percy	" 10	99	50	Stiff	3	Beardless	4,180	29	20	60	Badly.
Cartier	" 13	102	38	Fair	3	Bearded	4,800	28	..	58½	"
Ebert	" 12	102	43	Stiff	3	Beardless	3,820	28	..	59½	"
Crawford	" 15	105	46	Fair	3	"	5,060	28	..	58½	"
Red Fern	" 20	110	48	"	3	Bearded	5,220	28	..	60	"
Fraser	" 15	105	42	Weak	2½	"	5,740	27	20	58	"
Dion's	" 19	108	50	Stiff	3	"	5,800	27	20	60	"
Early Riga	" 7	96	34	"	2½	Beardless	5,360	27	20	59½	"
Ladoga	" 16	105	42	"	3	Bearded	5,120	27	..	57	Slightly.
Herrisson Bearded	" 15	105	40	Weak	2	"	5,660	26	40	58	Badly.
Countess	" 22	111	24	Stiff	2½	Beardless	4,460	26	20	58½	"
Robin's Rust Proof	" 22	111	42	Fair	3	"	5,320	26	..	60	"
Beaudry	" 14	103	42	Weak	2½	Bearded	5,360	25	40	58½	"
Australian No. 10	" 22	112	45	Fair	3¾	Beardless	6,560	25	20	55	"
Minnesota No. 181	" 22	112	44	Weak	3	"	5,940	25	..	56	"
Bishop	" 16	106	45	Stiff	3	"	4,400	24	40	58	"
Red Swedish	" 20	109	40	Weak	3	"	4,880	24	20	59	"
Essex	" 20	109	47	"	3½	"	5,240	24	..	56	"
Harold	" 17	107	40	"	2	Bearded	6,440	23	20	57½	"
Australian No. 25	" 22	112	46	Fair	3¾	Beardless	5,600	21	20	55	"
Cassell	" 22	112	45	Weak	3½	"	6,040	20	40	56	"
Hastings	" 20	109	44	"	3	"	5,240	20	40	59	"
Australian No. 23	" 22	111	46	"	3½	"	5,920	19	20	55½	"
Chester	" 22	111	44	Fair	3	"	5,320	19	20	57½	"
Captor	" 14	103	39	"	3½	"	6,260	18	..	59	"
Australian No. 19	" 22	112	43	"	3½	"	6,200	18	..	55	"
Australian No. 27	" 20	110	45	"	3½	"	5,240	17	20	55½	"
Japanesse	" 28	99	43	"	3	Bearded	1,860	17	40	50	Slightly.

AVERAGE Results of a Five Years' Test of Twelve Varieties of Wheat.

Name of Variety.	Years included.	Average Yield per Acre.	
		Bush.	Lbs.
Goose	1896, 1897, 1898, 1899, 1901	40	32
Monarch	1896, 1897, 1898, 1899, 1901	37	2
White Fife	1896, 1897, 1898, 1899, 1901	36	36
Crown	1896, 1897, 1898, 1899, 1901	36	32
Red Fife	1896, 1897, 1898, 1899, 1901	34	42
White Russian	1896, 1897, 1898, 1899, 1901	34	28
Hungarian	1896, 1897, 1898, 1899, 1901	32	38
Pringle's Champlain	1896, 1897, 1898, 1899, 1901	32	32
Huron	1896, 1897, 1898, 1899, 1901	32	22
Advance	1896, 1897, 1898, 1899, 1901	31	22
Colorado	1896, 1897, 1898, 1899, 1901	29	24
Herrisson Bearded	1896, 1897, 1898, 1899, 1901	27	42

FIELD PLOTS OF SPRING WHEAT.

All were sown on summer-fallow in the proportion of one and a half bushels of seed per acre.

Variety.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Yield per Acre.	
		Acres.				Bush.	Lbs.
Red Fife	Clay loam	7	April 24	Aug. 12	110	28	42
Preston	"	5	" 24	" 14	112	33	36
"	Sandy loam	5	" 8	" 8	122	21	18
White Fife	"	5	" 22	" 12	112	23	30
Stanley	"	3	" 22	" 8	108	25	27
Red Fife	"	3	" 22	" 12	112	26	..
White Connell	"	2	" 23	" 12	111	26	45
Percy	"	2	" 24	" 8	106	28	..
Monarch	Clay loam	2	" 24	" 21	119	31	30
Speltz	"	2	" 25	" 16	113	47	10
Dawn	Sandy loam	1	" 10	" 7	119	22	..
Wellman's Fife	"	1	" 10	" 10	122	30	..
Ladoga	"	1	" 23	" 8	107	29	..
Crown	"	1	" 23	" 9	108	26	..
Advance	"	1	" 23	" 8	107	32	..
Huron	Clay loam	$\frac{3}{4}$	" 25	" 12	109	41	24
Laurel	"	$\frac{1}{2}$	" 26	" 21	117	37	
White Russian	"	$\frac{1}{2}$	" 26	" 16	112	31	

THICK AND THIN SOWING OF WHEAT.

As many requests for information on this point reach the Experimental Farm, it was thought advisable to repeat the experiment. Evidently, fairly thick seeding, such as the usual $1\frac{1}{2}$ bushels per acre, gives the largest return on such soil as that on the Experimental Farm.

The size of the plots for this test was 1-20 acre, and the soil was a rich sandy loam, which had been summer-fallowed, and they were all sown on May 2.

WHEAT—THICK AND THIN SOWING.

Name of Variety.	Amount of Seed sown per Acre.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	Weight per Bushel.
				Inches.		Inches.		Bush. Lbs.	Lbs.
Wellman's Fife.	6 pecks...	Aug. 20..	110	50	Stiff......	3½	Beardless.	36 ..	59½*
" ..	5 " ...	" 20..	110	50	"	3½	" .	31 20	59½*
" ..	4 " ...	" 20..	110	50	"	3½	" .	23 20	56½*

* Badly rusted.

WHEAT AND FLAX MIXED.

This mixture is grown quite extensively in portions of the Red River Valley, in the United States.

One peck of flax and seven pecks of wheat are sown at the same time. The combined crop is cut and threshed, and the grain is separated with a fanning mill.

On the Experimental Farm, both the flax and the wheat germinated well, but the wheat soon took the lead and crowded out the flax, so that the stalks were exceedingly small and did not produce seed.

The size of the plots used for this test was one-twentieth of an acre, and the soil was a sandy loam, summer-fallowed.

Quantity of Wheat sown per Acre.	Quantity of Flax sown per Acre.	Date Sown.	Date Ripe.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
					Bush. Lbs.	Lbs.
7 pecks...............	1 peck................	May 15.....	August 28..	105	21 20	57½
7 "	None...........	" 15.....	" 28..	105	28 40	59

WHEAT AND RAPE MIXED.

Where fall pasture is scarce, this mixture is used to a considerable extent. The rape is sown with the wheat at the rate of 2 pounds per acre, and both are allowed to grow together until harvest, when the binder is set high enough to miss the rape. After the crop of grain is cut, the rape is pastured off.

This year, the rape only grew on the outer edges of the plot and on any thin spot among the grain. Altogether, not more than 50 rape plants grew, and the yield of rape was not sufficient to pay for the seed sown.

The size of plot used for this test was one-twentieth acre. The soil was a sandy loam, summer-fallowed, and both plots were sown on May 15.

Quantity of Wheat sown per Acre.	Quantity of Rape sown per Acre.	Date Sown.	Date Ripe.	Number of Days Maturing.	Yield per Acre.	Weight per Bushel.
					Bush. Lbs.	Lbs.
7 pecks..............	2 pounds........... .	May 15.....	August 28..	105	25 40	57
7 "	None.................	" 15.....	" 28..	105	28 40	59

SUMMER-FALLOW COMPARED WITH UNPLOUGHED STUBBLE.

This year the difference in favour of summer-fallow is less than usual, no doubt owing to the rank growth on the latter. The stubble land had only borne one crop since it was summer-fallowed.

The size of plots used for this test was one-fortieth of an acre, and the soil was a sandy loam. Both plots were sown on May 15.

Variety.	How Prepared.	Rust.	Ripe.	Length of Straw.	Length of Head.	Yield per Acre.	Weight per Bushel.
				Inches.	Inches.	Bush. Lbs.	Lbs.
Red Fife..........	Summer-fallowed ..	Little	Aug. 28...	45	3	28 40	59
"	Stubble, unploughed	"	" 28...	42	3	28 ..	58

A TEST OF FERTILIZERS FOR THE GROWING OF WHEAT.

Unlike last year's experience with this test, the conditions were quite favourable. A shower followed directly after the spreading of the fertilizers, and they were at once washed into the soil and the wind had no opportunity to blow them away.

From the accompanying tables it will be noticed that the plants treated with nitrate of soda have given the best returns.

The size of the plots was one-fortieth acre, the soil was a rich clay loam which had been summer-fallowed. All were sown on May 10, and all were harvested on August 23.

The variety of wheat sown on all the plots was Red Fife, one and one-half bushels of seed per acre.

Red Fife Wheat, Fertilizers Applied.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw per Acre.	Yield per Acre of Wheat.	Weight per Bushel.
	In.		In.			Bush. Lbs.	Lbs.
100 lbs. per acre of nitrate of soda, ½ sprinkled when the grain was 2 in. high, balance when 6 in. high..........	49	Stiff..	3	Beardless.	4,000	39 20	60
200 lbs. per acre of nitrate of soda, ½ sprinkled when the grain was 2 in. high, balance when 6 in. high..................................	47	" ..	3	" ..	4,300	40 ..	60¼
No fertilizer used	49	" ..	3	" ..	5,100	31 20	59¾
Superphosphate, 400 lbs. per acre, spread just before sowing...	51	" ..	4	" ..	3,700	25 20	58¼
Muriate of potash, 200 lbs. per acre, spread just before sowing......	48	" ..	3	" ..	4,200	30 40	59¾
A mixture, 200 lbs. superphosphate, 100 lbs. of nitrate of soda, 100 lbs. muriate potash, per acre, ½ spread before sowing, ½ when 2 or 3 inches high..................................	50	" ..	3½	" ..	5,800	32 40	60

SELECTED AND UNSELECTED SEED.

During the harvest season of 1900, the largest heads were selected from the standing grain of thirty-four varieties of wheat and six of barley. The seed was sown this year for a comparison with unselected seed from the same plots.

The plots were all the same size, viz., 1-20 acre, and each pair was sown in close proximity. The accompanying tables give the result of each individual variety and also a summary which shows great variation in the returns, the average, however, shows that the unselected wheat yielded 9 pounds per acre more than the selected, and the selected barley 1 bushel 32 pounds per acre more than the unselected.

The soil was a sandy loam, summer-fallowed. The plots of wheat were sown from the 1st to the 7th of May, and those of barley on the 17th of that month.

WHEAT.

Name of Variety.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Lbs.	Bush.	Lbs.	Lbs.
Goose—Selected	5,140	41	..	62
" Unselected	4,820	42	20	62½
Huron—Selected	5,120	37	..	61
" Unselected	4,720	35	20	59
White Fife—Selected	5,380	37	..	60
" Unselected	5,380	34	20	60
Blenheim—Selected	5,200	36	40	59
" Unselected	5,460	32	20	58
Dions—Selected	5,340	36	..	61
" Unselected	5,800	27	20	60
White Russian—Selected	3,460	36	..	59¾
" Unselected	5,880	36	..	58½
Progress—Selected	5,380	35	20	59
" Unselected	3,180	37	..	60
White Connell—Selected	5,400	35	..	60
" Unselected	5,400	34	..	59¼
Crown—Selected	5,520	34	40	59
" Unselected	5,020	38	..	59½
Admiral—Selected	5,340	34	20	59½
" Unselected	4,700	37	20	59½
Colorado—Selected	5,340	34	20	60½
" Unselected	6,420	31	20	59
Beauty—Selected	5,660	34	..	58
" Unselected	5,300	35	40	58½
Stanley—Selected	5,660	34	..	58½
" Unselected	5,080	36	..	59½
Red Fife—Selected	5,140	34	..	59
" Unselected	5,140	36	40	60
Preston—Selected	4,940	34	..	60
" Unselected	4,940	31	..	58½
Laurel—Selected	6,080	33	40	57½
" Unselected	6,040	35	..	56
Weldon—Selected	6,180	33	40	59½
" Unselected	5,840	31	40	59
Campbell's White Chaff—Selected	3,500	33	20	60
" " Unselected	3,640	33	..	59
Mason—Selected	4,720	33	..	60¼
" Unselected	3,680	31	..	61
Rideau—Selected	5,120	32	40	59½
" Unselected	3,760	33	..	59
Dawn—Selected	5,280	32	..	58¼
" Unselected	4,440	33	20	59½
Hungarian—Selected	5,200	31	40	59
" Unselected	4,660	29	40	59½
Captor—Selected	5,680	30	20	57¼
" Unselected	6,260	18	..	59
Dufferin—Selected	4,900	30	..	59
" Unselected	3,860	30	40	59
Alpha—Selected	5,600	30	..	58
" Unselected	5,640	35	..	59
Monarch—Selected	5,100	30	..	59
" Unselected	5,220	36	20	59½
Ladoga—Selected	5,000	30	..	59½
" Unselected	5,120	27	..	57
Clyde—Selected	5,720	29	40	58½
" Unselected	4,540	36	40	59½
Beaudry—Selected	5,520	29	40	60
" Unselected	5,360	25	40	58½
Percy—Selected	4,740	29	20	58¾
" Unselected	4,180	29	20	60
Wellman's Fife—Selected	7,040	29	..	58½
" Unselected	5,060	34	40	59½
Advance—Selected	5,420	28	..	59
" Unselected	5,180	34	20	59
Blue Stem—Selected	4,900	26	..	56
" Unselected	4,900	31	40	57¼
Red Swedish—Selected	5,320	24	40	58
" Unselected	4,880	24	20	59

Summary.	Bush.	Lbs.
Average yield of 34 varieties, selected	32	39
" " 34 " unselected	32	48

BARLEY.

Name of Variety.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Lbs.	Bush.	Lbs.	Lbs.
Odessa—Selected (1899)	3,800	50	..	46
" Unselected	3,300	26	32	45
Fulton—Selected	3,500	33	16	47
" Unselected	3,260	36	12	47
Harvey—Selected	3,320	28	36	48
" Unselected	4,060	42	24	48
Prize Prolific —Selected	2,910	20	30	46
" " Unselected	2,940	24	8	46
Sidney—Selected	2,860	19	28	47
" Unselected	3,460	25	40	47
Common—Selected	2,200	41	32	46½
" Unselected	3,200	29	8	46

Summary.	Bush.	Lbs.
Average yield of 6 varieties, selected	32	16
" " unselected	30	32

EXPERIMENT WITH SPELTZ.

This grain is still attracting considerable attention throughout the province, and numerous inquiries regarding it are received at the Experimental Farm.

A noticeable feature in connection with this grain during the past wet harvest, was the bright almost rust proof straw which remained quite bright in spite of the several weeks exposure in the stook. A stack of this straw has been saved for the purpose of testing its feeding value for cattle.

On rich summer-fallowed land the Speltz straw leaned badly, but not sufficient to prevent the binders from cutting all the way around the field.

The accompanying table gives the yield of Speltz, as compared with Red Fife wheat, American Beauty oats, and Mensury barley. The size of the plots was one-fortieth acre. The soil was a sandy loam, summer-fallowed.

In another part of this report will be found the particulars of the feeding value of this grain for steers.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Weight of Straw per Acre.	Weight of Grain per Acre.
				Lbs.	Lbs.
Speltz Wheat	May 15	Aug. 29	106	4,720	3,080
Red Fife Wheat	" 15	" 28	105	6,460	1,720
American Beauty Oats	" 15	" 28	105	4,480	2,320
Mensury Barley	" 17	" 20	95	3,660	2,320

SPELTZ—THICK AND THIN SOWING.

The unusual size and formation of the berry of speltz causes much uncertainty regarding the most suitable manner of setting the grain drill. The accompanying table gives the result of setting the Massey-Harris Shoe Drill, one bushel, one and a half bushels, and one and three-quarter bushels per acre.

The size of the plots was one-twentieth acre, and the soil was a sandy loam, which had been summer-fallowed.

Speltz Wheat—Thick and Thin Sowing.

Name of Variety.	Drill set for.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Bushel.
	Per Acre.				Ins.		Ins.		Bush.	Lbs.	Lbs.
Speltz	1 Bushel	May 15	Sept. 6	114	43	Weak	3	Bearded	33	20	41
"	$1\frac{1}{2}$ "	" 15	" 6	114	43	"	3	"	37	20	43
"	$1\frac{3}{4}$ "	" 15	" 6	114	43	"	3	"	46		$43\frac{1}{2}$

Summer-fallowed vs. Unploughed Stubble for Speltz.

The small difference of yield in favour of the summer-fallow is no doubt largely attributable to the abundance of rain during the growing season. The test was made on plots of one-twentieth acre. The soil was a clay loam.

Variety.	How Prepared.	Date of Sowing.	Ripe.	Length of Straw.	Length of Head.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.	Bush.	Lbs.	Lbs.
Speltz	Stubble, unploughed.	May 15	Aug. 28	36	2	48	40	$41\frac{1}{2}$
"	Summer-fallow	" 15	" 29	47	2	51	20	44

ROTATION OF CROPS.

Two years ago, in accordance with your instructions, arrangements were made for a series of rotation plots, the principal object being the maintenance of the fertility of the soil, by ploughing under a leguminous crop every third year, instead of the usual summer-fallow.

The Soja beans were sown in rows 14 inches apart, using 60 pounds of seed per acre. The Red Clover was sown at the rate of 12 pounds per acre, and the mixed clovers in the proportion of 8 pounds of Alfalfa and 6 pounds of Alsike per acre. These leguminous plants were ploughed under when they reached their fullest development. The order of rotation is as follows:—

1899.	1900.	1901.
Soja Beans	Wheat	Oats.
Pease	Wheat	Wheat.
Tares	Wheat	Oats.
Red Clover	Wheat	Wheat.
Alfalfa and Alsike	Wheat	Barley.
Wheat	Oats	Soja Beans.
Wheat	Wheat	Pease.
Wheat	Oats	Tares.
Wheat	Wheat	Red Clover.
Wheat	Barley	Alfalfa and Alsike.
Oats	Soja Beans	Wheat.
Wheat	Pease	Wheat.
Oats	Tares	Wheat.
Wheat	Red Clover	Wheat.
Barley	Alfalfa and Alsike	Wheat.
Wheat	Wheat	Summer-fallow.
Wheat	Oats	"
Wheat	Barley	"
Wheat	Wheat	Oats.
Wheat	Barley	Oats.

Results of Third Year (1901) on Rotation Plots.

Plot.	Name of Variety.	Previous Crop.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Yield per Acre.		Weight per Bushel.
						Inches.	Bush.	Lbs.	Lbs.
1	Oats—Banner	Wheat	May 8	Aug. 18	102	46	70	2	35
2	Wheat—Red Fife	Wheat	April 26	" 16	112	48	38	54	60
3	Oats—Banner	Wheat	May 8	" 18	102	47	73	24	34½
4	Wheat—Red Fife	Wheat	April 26	" 16	112	49	38	40	60
5	Barley	Wheat	May 22	" 17	87	37	37	2	46
6	Soja Beans	Oats	" 22	Ploughed under Aug. 12.					
7	Pease	Wheat	" 11	" " " 7.					
8	Tares	Oats	" 11	" " " 8.					
9	Red Clover	Wheat	" 22	" " " 9.					
10	Alfalfa and Alsike	Barley	" 22	" " " 10.					
11	Wheat—Red Fife	Soja Beans	April 26	Aug. 17	113	45	38	18	60
12	Wheat "	Pease	" 26	" 17	113	47	37	6	60
13	Wheat "	Tares	" 26	" 17	113	47	39	22	60
14	Wheat "	Red Clover	" 26	" 17	113	44	25	18	60
15	Wheat "	Alfalfa and Alsike	" 26	" 17	113	47	28	42	60
16	Summer-fallow	Wheat							
17	"	Oats							
18	"	Barley							
19	Oats—Banner	Wheat	May 8	Aug. 17	101	49	51	30	40
20	Oats "	Barley	" 8	" 17	101	45	55	..	40½

Summary of Results for Three Years.

Plot.	Variety.	Yield per Acre.		Variety.	Yield Per Acre.		Variety.	Yield per Acre.	
	1899.	Bush.	Lbs.	1900.	Bush.	Lbs.	1901.	Bush.	Lbs.
1	Soja Beans			Wheat—Red Fife	27	42	Oats—Banner	70	2
2	Tease, Golden Vine			Wheat "	23	42	Wheat—Red Fife	38	54
3	Pares	Ploughed		Wheat "	25	4	Oats—Banner	73	24
4	Red Clover		under.	Wheat "	15	14	Wheat—Red Fife	38	40
5	Alfalfa and Alsike			Wheat "	11	42	Barley—Mensury	37	2
6	Wheat—Red Fife	27	44	Oats—Banner	18	32	Soja Beans		
7	Wheat "	29	8	Wheat—Red Fife	8	26	Pease, Golden Vine		
8	Wheat "	27	2	Oats—Banner	26	22	Tares	Ploughed	
9	Wheat "	21	0	Wheat—Red Fife	6	12	Red Clover		under.
10	Wheat "	26	54	Barley—Odessa	12	44	Alfalfa and Alsike.		
11	Oats—Bavarian	27	44	Soja Beans			Wheat—Red Fife	38	18
12	Wheat—Red Fife.	27	20	Pease, Golden Vine			Wheat "	37	6
13	Oats—Bavarian	26	46	Tares	Ploughed		Wheat "	39	22
14	Wheat—Red Fife.	27	30	Red Clover		under.	Wheat "	25	18
15	Barley—Odessa	38	38	Alfalfa and Alsike.			Wheat "	28	42
16	Wheat—Red Fife.	28	8	Wheat—Red Fife	7	34	Summer-fallow		
17	Wheat "	29	16	Oats—Banner	33	12	"		
18	Wheat "	24	2	Barley—Odessa	15	32	"		
19	Wheat "	26	32	Wheat—Red Fife	6	48	Oats—Banner	51	30
20	Wheat "	27	12	Barley, Odessa	16	44	Oats "	55	..

Summary.

Although further time will be required before any definite conclusions can be drawn regarding the principal object of this experiment, there are already some suggestive results.

Better returns were obtained in both this and last year from ploughing under annual leguminous crops than from ploughing under clovers.

Plots one and three have each given more pounds of the same kind of grain in two years than No. 19 has in three years.

EXPERIMENTS WITH OATS.

Generally speaking, the oat crop throughout the province is above the average. On the Experimental Farm the yield has been good and the straw stiff, but the sample, owing to rust, is somewhat lighter than usual.

All the seed was treated with formalin, and there was a total absence of smut.

The newly introduced 'Tartar King Oat' is a new white, sided variety with a remarkably stiff straw, and very handsome in appearance, but the yield, both in the field and the smaller plots, is somewhat disappointing.

Another distinct new variety is 'Goldfinder Oats.' It has a somewhat thin and yellow oat, with a good stiff straw. The yield this year was better than that of the Tartar King, but not equal to many of the other varieties.

Average yields of twelve of the most promising varieties are also given. It will be noticed that Banner leads in productiveness.

The tests were made with sixty-five varieties, on plots of one-twentieth acre each. The soil was a sandy loam, summer-fallowed, and 2 bushels of seed was used per acre, sown with a drill.

Salzer's Big 4 and Milford were sown on June 1, and all the other varieties from May 10 to 13.

OATS—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.		Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Early Maine	Aug.	23	102	48	Fair	10	Branching	3,120	91	26	34½	Badly.
Improved American	"	23	102	55	Stiff	10	"	4,640	90	..	35	Slightly.
White Giant	"	24	103	56	Fair	10	"	4,960	89	14	33	Badly.
Danish Island	"	22	101	56	Stiff	9	"	4,060	89	14	35	Slightly.
Wide Awake	"	24	103	51	"	8	"	4,460	89	14	36	"
Siberian	"	22	101	55	"	12	"	4,880	88	28	35	Badly.
Golden Beauty	"	25	104	46	"	9	"	3,980	88	28	36	Slightly.
American Triumph	"	22	101	51	Fair	9	"	3,940	87	2	34½	"
White Schonen	"	22	101	50	"	10	"	4,640	87	2	37	"
Wallis	"	24	103	50	Stiff	11	"	2,180	86	16	36	Badly.
Lincoln	"	22	101	50	"	9	"	4,280	85	30	35	"
Banner	"	24	103	55	Fair	12	"	4,700	85	10	34	Slightly.
Irish Victor	"	20	99	48	Stiff	8	"	4,120	84	24	34½	"
Columbus	"	20	99	46	Weak	8	"	4,440	84	4	35½	Badly.
Bavarian	"	22	101	54	Stiff	9	"	3,940	84	4	36	"
Abundance	"	23	102	54	"	12	"	4,360	83	18	36	Slightly.
Golden Tartarian	"	27	106	50	"	11	Sided	4,780	82	32	32	Badly.
Holstein Prolific	"	23	102	50	Fair	9	Branching	4,340	81	26	36½	Slightly.
Hazlett's Seizure	"	14	93	50	"	12	"	4,640	81	6	37	Badly.
Improved Ligowo	"	20	99	50	"	11	"	3,940	81	6	37	"
Mennonite	"	22	101	48	"	10	"	3,980	80	..	33½	"
American Beauty	"	20	99	48	"	11	"	4,200	79	14	35½	Slightly.
New Zealand	"	26	105	56	Stiff	12	Sided	5,440	78	8	38½	None.
Waverley	"	25	104	55	"	11	Branching	4,640	78	8	35	Badly.
Rosedale	"	25	104	60	"	12½	Sided	3,100	76	16	37½	Slightly.
Sensation	"	20	102	55	Fair	10	Branching	3,640	75	10	39	Badly.
Early Gothland	"	25	104	55	Stiff	10½	Sided	5,440	75	10	38	Slightly.
Early Blossom	"	25	104	52	"	10	"	5,360	74	24	34½	"
Buckbee's Illinois	"	27	106	56	"	11	Branching	5,500	73	18	34½	Badly.
Early Archangel	"	22	101	50	"	9	"	4,300	73	18	37	Slightly.
Goldfinder	"	28	110	58	"	12½	Sided	4,900	73	18	38	Badly.
Cream Egyptian	"	11	90	48	"	8	"	4,140	72	12	40	"
Oderbruch	"	25	104	52	Fair	9	"	3,160	71	26	34	"
Russell	"	25	104	54	"	12½	Branching	4,880	71	6	33	"
Kendal	"	28	110	57	Stiff	10½	Sided	5,200	70	20	36	"
Abyssinia	"	23	102	52	Fair	10½	Sided	4,700	70	20	37	"
Olive	"	27	109	57	"	11	"	5,120	70	..	35	"
Golden Giant	"	27	106	51	Stiff	12	"	4,220	70	..	34¼	"
Miller	"	25	104	50	Fair	10	Branching	5,220	70	..	33½	"
Bonanza	"	10	89	44	"	7	"	3,740	69	14	42	"
White Wonder	"	13	92	50	Weak	11	"	4,240	69	14	40	"
California Prolific Black	"	28	110	57	Stiff	10	Sided	5,440	69	14	32	"
White Russian	"	22	101	54	Weak	9	Branching	4,540	69	14	36	"
Joanette	"	28	110	48	"	10	"	4,660	68	28	34	"
Newmarket	"	23	102	48	Stiff	12	"	3,480	68	8	37½	Slightly.
Thousand Dollar	"	23	102	52	Fair	9	"	3,680	68	8	34½	Badly.
Holland	"	31	110	54	Stiff	12	Sided	4,900	67	22	30	"
Early Golden Prolific	"	25	104	54	Fair	10	Branching	3,620	67	2	34½	"
Master	"	23	102	52	Stiff	12½	Sided	4,340	66	16	36½	Slightly.
King	"	26	105	50	Fair	12	Branching	5,260	65	30	34½	Badly.
Oxford	"	23	102	53	Stiff	12½	Sided	4,360	65	30	37	Slightly.
Cromwell	"	22	101	56	Weak	12	"	5,280	65	10	33	Badly.
Black Mesdag	"	12	94	50	"	9	Branching	3,800	64	24	35½	"
Salines	"	26	105	54	Stiff	11	"	4,340	63	18	33	Slightly.
Prize Cluster	"	13	92	52	Weak	10	"	4,340	63	18	40	Badly.
Brandon	"	24	103	44	Stiff	8½	Sided	4,680	62	12	36½	"
Pioneer	"	22	101	46	"	10	Branching	4,700	61	26	37	"
Prolific Black Tartarian	"	25	107	51	"	9	Sided	5,440	60	20	32	Slightly.
Salzer's Big 4	"	31	91	50	Weak	8	Branching	2,120	60	20	34	Badly.
Pense	"	28	110	51	Stiff	10½	Sided	5,480	59	14	32	"
Tartar King	"	22	101	49	"	10	Sided	3,800	58	28	34	Slightly.
Black Beauty	"	26	108	52	Weak	12	Branching	4,740	57	22	33	Badly.
Flying Scotchman	"	20	99	51	Stiff	12	"	4,140	57	22	37½	Slightly.
Scotch Potato	"	26	105	52	"	12	"	5,660	45	10	33½	Badly.
Milford	Sept.	7	98	45	"	8½	Sided	4,820	31	6	18	"

AVERAGE Results of a Five Years' Test of Eight Varieties of Oats.

Variety.	Years included.	Average Yield Per acre.	
		Bush.	Lbs.
Banner	1896-97-98-99-1901	91	..
Golden Beauty	1896-97-98-99-1901	83	26
Early Golden Prolific	1896-97-98-99-1901	83	14
White Schonen	1896-97-98-99-1901	81	30
Holstein Prolific	1896-97-98-99-1901	81	..
Abundance	1896-97-98-99-1901	78	32
Improved Ligowo	1896-97-98-99-1901	75	26
Master	1896-97-98-99-1901	72	2

FIELD PLOTS OF OATS.

These were all sown on summer-fallow, with a drill, in the proportion of two bushels of seed per acre.

Variety.	Character of Soil.	Size of Plot.	Date Sown.	Date Ripe.	Number Days Maturing.	Yield per acre.	
		Acres.				Bush.	Lbs.
Ligowo Oats	Sandy loam	5	Apl. 25	Aug. 16	114	59	9
American Beauty	"	3	May 1	" 19	110	49	2
Tartar King	Clay loam	3	" 9	" 21	104	59	18
Waverley	"	3	" 14	" 25	103	69	9
Banner	Sandy loam	3	" 8	" 20	104	68	18
Abundance	"	2	" 1	" 20	111	75	9
Goldfinder	Clay loam	1	" 14	" 31	109	63	10

EXPERIMENTS WITH BARLEY.

Fifty-two varieties of barley were tested this year. The yield of nearly all the varieties was greatly lessened by rust, which attacked the plants very early this year. It was particularly bad in two-rowed sorts, discolouring the straw and shrivelling up the head.

Mensury, the leading variety for productiveness, has proved itself one of the best for this district. The plant is vigorous, the straw stiff and usually free from rust.

The Hulless varieties, both black and white, are just now being recommended highly, by interested parties, but these sorts have not proved satisfactory here. The straw is very weak and the yield of grain below many other kinds.

The two beardless varieties, Excelsior and Success, are also unsuitable for this province. The straw is very brittle, and owing to excessive and late stooling, the crop of grain ripens unevenly, and is light in weight.

The size of plots used for this test of varieties was one-twentieth acre. The soil was a sandy loam which had been summer-fallowed. All were sown on May 17 and 18, in the proportion of two bushels of seed per acre.

Barley—Six Rowed—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
Mensury	Aug. 20	95	41	Stiff	3½	3,660	48	16	46	Slightly.
Mansfield.......	" 12	87	44	"	3	3,100	47	24	46	"
Yale	" 16	91	39	Fair	3	3,640	47	4	46	Badly.
Garfield	" 20	95	40	Stiff	3½	3,180	46	12	47	"
Albert..........	" 12	87	38	Fair	2½	2,860	44	8	47	Considerably.
Phoenix	" 12	87	34	Stiff	4	2,760	44	8	49½	Slightly.
Argyle..........	" 16	91	42	Fair	3	4,100	43	36	47	Badly.
Petschora.......	" 16	91	38	Stiff	3½	3,000	41	32	47	"
Excelsior	" 12	87	46	"	3	3,140	40	40	41	"
Claude	" 20	95	49	"	3	3,840	38	36	47	"
Summit	" 16	91	39	"	3	3,200	37	24	47	"
Baxter	" 16	91	43	Weak	3	3,000	37	24	48	"
Hulless Black...	" 18	93	40	"	3	3,520	36	32	61	"
Nugent	" 19	94	37	Stiff	2½	2,080	33	36	47	"
Royal...........	" 16	91	34	"	3½	2,580	33	36	47	"
Empire	" 20	95	36	"	3	2,600	33	16	46½	Slightly.
Blue Long Head	" 20	95	33	"	3½	2,800	33	16	46	Badly.
Surprise........	" 19	94	36	"	2½	3,160	32	4	47	"
Rennie's Imp'v'd	" 17	92	43	Weak	2½	3,660	32	4	47½	"
Champion	" 13	88	37	Stiff	2½	2,200	30	40	41	Slightly.
Vanguard	" 14	89	41	"	3½	2,980	29	28	47	Badly.
Oderbruch.....	" 17	92	41	Weak ..	2	3,160	29	28	46	"
Success.........	" 18	93	42	"	2	2,660	29	28	40	Slightly.
Common........	" 14	89	41	"	3	3,200	29	8	46	Badly.
Trooper	" 20	95	36	Fair	3	3,800	29	8	46	"
Brome..........	" 20	95	36	Weak	3	3,160	27	44	48	"
Pioneer.........	" 15	90	39	Stiff	3	3,880	27	24	49	"
Odessa	" 18	93	39	Weak	3½	3,300	26	32	45	"
Stella	" 20	95	37	Fair	3	3,460	21	32	47	"
Hulless White..	" 12	87	32	Weak	2½	2,100	16	12	55	"

Barley—Two Rowed—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	
Jarvis..........	Aug. 16	91	47	Fair	4	3,480	47	44	47	Slightly.
Gordon	" 20	95	44	Stiff	3	3,180	43	36	46½	Badly.
Harvey	" 20	94	43	Weak	4	4,060	42	24	48	"
Dunham... . ..	" 16	91	40	"	4	3,700	41	32	48	"
Clifford.........	" 16	91	43	Fair	4	3,120	39	8	48	"
Fulton	" 20	94	40	Stiff	3	3,260	36	12	47	Slightly.
Logan....	" 22	96	44	"	4	3,400	35	20	48	Badly.
Leslie...........	" 18	93	44	Fair	4½	2,800	35	20	50	"
Nepean	" 18	93	48	Weak ...	3½	3,880	31	32	47	"
Standwell	" 22	96	38	Stiff	3	2,840	30	20	47	"
Invincible ...	" 20	95	42	Fair	4	2,700	29	8	49	"
Kirby	" 19	94	40	Weak	3½	3,340	28	16	49	"
Victor	" 17	92	43	"	4	3,760	27	44	48½	"
Canadian Thorpe	" 20	95	45	Stiff	4	3,490	27	14	48	"
Bolton	" 15	90	34	Weak	4	3,640	26	12	48	"
Sidney	" 16	90	39	"	3½	3,460	25	40	47	"
Prize Prolific ...	" 22	96	39	" ...	3	2,940	24	8	46	"
French Chevalier	" 22	97	39	Stiff	4½	2,560	23	36	46	"
Newton	" 22	97	30	"	3	1,860	19	28	48	"
Danish Chevalier	" 22	96	32	Fair	4	3,280	19	8	45½	"
Beaver	" 22	96	30	Stiff	4	3,100	18	36	47½	"
Kinver Chevalier	" 22	97	36	Fair	4	3,060	17	24	44½	"

AVERAGE Results of a Five Years' Test of Twelve Varieties of Barley.

Name of Variety.	Years included.	Average Yield per Acre. Bush.	Lbs.
Mensury	1896-97-98-99-1901	51	12
Trooper	1896-97-98-99-1901	50	..
Common	1896-97-98-99-1901	49	14
Phœnix	1896-97-98-99-1901	46	46
Nugent	1896-97-98-99-1901	46	32
Excelsior	1896-97-98-99-1901	45	14
Stella	1896-97-98-99-1901	44	26
Royal	1896-97-98-99-1901	43	32
Champion	1896-97-98-99-1901	43	6
Bolton	1896-97-98-99-1901	42	44
Newton	1896-97-98-99-1901	40	42
Danish Chevalier	1896-97-98-99-1901	35	34

FIELD PLOTS OF BARLEY.

All these were sown on summer-fallow ; soil clay-loam ; sown at the rate of two bushels of seed per acre.

Variety.	Character of Soil.	Size of Plot.	Date Sown.	Date Ripe.	Number Days Maturing.	Yield per Acre.	
		Acres.				Bush.	Lbs.
Mensury	Clay loam..	3	May 20....	Aug. 21....	93	43	45
Bolton	" ..	2	" 21....	" 14....	85	34	19
Beaver	" ..	1	" 21....	" 19....	90	55	15
Invincible	" ..	½	" 21....	" 19...	90	32	46

SMUT PREVENTIVES FOR BARLEY.

This grain has been found the most difficult of all to treat successfully for smut. In certain seasons it seems very difficult to destroy the spores of this fungus. From the accompanying table in will be seen that the best results have been obtained this season from treatment with bluestone (sulphate of copper).

It is claimed that formalin gives the best results when the grain is covered with canvas for some hours after treatment, but judging from a comparison of plots No. 3 and No. 4, there was no apparent benefit from this method.

A series of experiments was also conducted in testing preventives of smut in wheat and oats, but all the plots, both treated and untreated, were this year equally free from smut.

Name of Variety.	How Treated.	Good Heads on 9 sq. ft.	Smutty Heads on 9 sq. ft.
Phœnix Barley..	Steeped for 1 hour, in 1 lb. bluestone to 3 pails water, and dried...	475	2
" ..	" " 4½ oz. formalin to 10 galls. water, and dried..	480	52
" ..	Sprinkled with 9 oz. formalin to 10 galls. water, and dried........	440	35
" ..	" 9 " " covered... . ..	400	36
" ..	" 1 lb. bluestone to 1 pail of water, and dried........	410	00

EXPERIMENTS WITH PEASE.

The yield of pease this year was not quite an average one, but the sample was excellent, and with the exception of four varieties, the experiment was a very successful test of varieties.

Chancellor, Kent, Agnes and Mackay, were all more or less injured by cutworms,

From the accompanying table it will be seen that pease are quite productive here. There is an absence of pea-weevil, and were it not for the labour of harvesting, this crop would prove very remunerative.

The land was summer-fallowed the previous year. The plots were one-twentieth of an acre, and the soil a rich clay loam. All the varieties, fifty-seven in number, were sown from May 4 to May 8.

PEASE—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				In.	In.		Bush.	Lbs.	Lbs.
Paragon	Sept. 2	121	Fair	58	2½	Medium	43	..	65½
Gregory	" 7	126	Rank	68	3	Large	42	30	65½
Macoun	" 10	127	"	48	3	Medium	41	40	64½
Picton	Aug. 30	115	Fair	84	3	Large	41	20	65
Victoria	Sept. 9	126	Rank	75	3	"	41	20	62
New Potter	" 11	130	"	51	3	"	41	20	64½
Mummy	" 5	122	Fair	48	2½	Small	39	40	62½
King	Aug. 28	116	Rank	46	2½	Medium	38	50	65
German White	" 29	117	Fair	68	3	"	38	40	64½
Crown	Sept. 7	124	Weak	54	2½	Small	38	30	65½
Elliot	" 6	125	"	48	3	Large	38	30	64
Prince	" 7	126	Rank	84	3	"	38	..	64½
Alma	Aug. 29	114	Fair	65	2¼	Small	37	20	65
Fenton	Sept. 2	119	Medium	54	3	Large	36	40	64
Early Britain	Aug. 29	117	Weak	44	3	Medium	36	20	61½
Prussian Blue	" 27	115	Rank	63	2½	"	36	20	65½
Nelson	" 20	108	Fair	40	3½	"	36	10	66
Cooper	Sept. 3	122	Rank	56	2½	"	36	..	65
Arthur	Aug. 27	115	Fair	43	6	"	35	50	65
Perth	" 30	118	Weak	48	2½	Large	35	40	64
Duke	" 21	105	Rank	66	3	"	35	20	64
Harrison's Glory	" 31	116	Fair	54	2¼	Small	35	..	65
Golden Vine	" 31	119	Weak	52	2½	"	35	..	64½
Carleton	Sept. 7	124	Fair	60	2¾	"	34	50	64
Canadian Beauty	" 7	126	Rank	80	2½	Large	34	40	64
Chelsea	" 6	123	Fair	54	3	Medium	34	20	62
Archer	" 7	124	"	51	3	Small	34	20	65
Pride	Aug. 31	119	"	35	3	Medium	34	20	64
Lanark	Sept. 2	121	Weak	52	3	Large	33	50	63½
Wisconsin Blue	Aug. 31	116	Fair	54	2½	Medium	33	30	66
Oddfellow	" 26	111	"	48	2	"	33	20	67
White Wonder	" 20	108	"	20	3	"	33	20	63
Agnes	" 31	119	Weak	48	2½	Large	33	10	62½
Dover	Sept. 8	125	Fair	68	2½	Medium	33	..	64
French Canner	Aug. 20	108	"	50	3¼	Small	33	..	65
Grass	Sept. 10	127	"	66	2	"	32	20	63
Trilby	" 10	127	Rank	72	2½	Medium	32	..	62½
Vincent	Aug. 20	104	Fair	55	3	Large	32	..	63½
Creeper	" 19	103	"	60	2½	Small	31	50	65
Bruce	" 29	113	"	50	3	Medium	31	50	65
Kent	Sept. 7	124	Weak	36	3	Large	31	..	64
Large White Marrowfat	" 10	127	Rank	72	3	"	31	..	63
Prince Albert	" 11	130	"	73	2½	Small	31	..	63
Chancellor	Aug. 26	111	Weak	36	2½	Medium	30	40	64½
Bedford	Sept. 2	119	Rank	63	2¾	Small	30	20	65
Black-eyed Marrowfat	Aug. 21	105	"	70	3	Medium	30	..	64½
English Grey	Sept. 10	127	Fair	48	3	"	29	50	61½
Centennial	" 10	129	Rank	62	3	"	29	50	64
Daniel O'Rourke	Aug. 30	116	Fair	69	3	Small	29	40	65
Fergus	" 20	104	Rank	86	3	"	29	40	65
Mackay	Sept. 7	124	"	51	3	Large	29	..	63
Multiplier	" 10	127	Fair	70	2½	Small	28	40	62½
Herald	" 7	124	"	51	2¾	"	28	30	64
Elephant Blue	" 8	127	Rank	63	3	Medium	28	20	64
Pearl	" 7	126	"	78	3	Small	27	20	64
Bright	" 9	128	"	79	3	Medium	25	40	65
Elder	" 10	129	"	76	2½	Small	16	30	64½

AVERAGE Results of a Five Years' Test of Twelve Varieties of Pease.

Variety.	Years included.	Average Yield per Acre.	
		Bush.	Lbs.
Mummy	1896-97-98-99-1901	45	54
New Potter	1896-97-98-99-1901	44	48
Carleton	1896-97-98-99-1901	44	46
Pride	1896-97-98-99-1901	44	2
Kent	1896-97-98-99-1901	42	32
Mackay	1896-97-98-99-1901	42	8
Trilby	1896-97-98-99-1901	42	4
Crown	1896-97-98-99-1901	40	14
Prince	1896-97-98-99-1901	39	8
Prince Albert	1896-97-98-99-1901	38	54
Agnes	1896-97-98-99-1901	38	38
Creeper	1896 97-98-99-1901	36	42

MIXED PEASE AND OATS.

The labour of harvesting pease in the usual way, added to the risk of loss from severe wind storms, has always proved a serious obstacle to their cultivation in this province.

A small quantity of oats, mixed with the pease at seeding, usually keeps the combined crop from lodging, and permits of a large proportion of the crop being secured with a binder, and stooked and threshed in the usual manner. The small quantity of pease missed by the binder can be gathered by the store hogs, usually plentiful at this season of the year.

The size of plots in this test was one-twentieth acre, and the soil was a sandy loam, summer-fallowed.

Quantity of Peas sown per Acre.	Quantity of Oats sown per Acre.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Total Yield per Acre.		Weight per Bushel.
					Bush.	Lbs.	Lbs.
2 bushel	1 peck	May 6	Aug. 27	113	46	20	43
2 "	2 "	" 6	" 27	113	57	20	38

THICK AND THIN SOWING OF PEASE.

It is usually difficult to get a close stand of pease in this country. For this reason, it was expected that a somewhat heavier sowing than usually practised in the East would give the best results, but the result of this year's test does not appear to confirm this opinion.

The size of the plots for this test was one-twentieth acre, the soil was a sandy loam, summer-fallowed, and all were sown on May 8.

Name of Variety.	Amount of Seed sown per Acre.	Character of Soil.	Size of Plot.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Size of Pea.	Total Yield per Acre.	
	Bush.		Acre.					In.	Lbs		Bush.	Lbs.
Potter...........	2	Sand loam	$\frac{1}{20}$	May 8	Aug. 29	113	Fair.. ..	60	$2\frac{1}{2}$	Medium..	33	40
"	$2\frac{1}{2}$	" ..	$\frac{1}{20}$	" 8	" 29	113	"	60	$2\frac{1}{2}$	" ..	33	40
"	3	" ..	$\frac{1}{20}$	" 8	" 29	113	"	60	$2\frac{1}{2}$	" ..	32	20

THICK AND THIN SEEDING OF FLAX.

The size of the plots for the test was one-twentieth acre, the soil was a sandy loam which had been summer-fallowed.

The accompanying table gives the second sowing for this test. The first plots were sown on May 16, and were destroyed by cutworm.

Variety.	Amount of Seed sown per Acre.	Date of Sowing.	Length of Straw.	Date when Pulled for Fibre.	Weight of Straw per Acre.	Yield of Seed per Acre.		Weight per Bushel.
	Lbs.		In.		Lbs.	Bush.	Lbs.	Lbs.
Flax	40	May 31..	26	Sept. 5....	2,800	14	56	56
"	30	" 31..	26	" 5....	2,200	11	44	56
"	20	" 31..	26	" 5...	2,400	11	14	56

BUCKWHEAT—A VOLUNTEER CROP.

One of the objections to the cultivation of buckwheat in this country is the fact that the grain ripens so unevenly that the first-formed grain shells before the rest is fully matured, and the shelled grain, coming up in the next year's crops, injures the samples.

The shelled grain in last year's buckwheat plots was lightly covered this spring, and the yield, as will be seen by the following tables, was a good one.

Variety.	Date Sown.	Date of Ripening.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Lbs.	Bush.	Lbs.	Lbs.
Japanese..........................	Autumn, 1900.........	Sept. 16..	220	28	19	47
Gray..............................	" 1900...... ..	" 16..	500	35	20	$48\frac{1}{2}$
Silver Hull.......................	" 1900..... ...	" 16..	440	32	32	52

EXPERIMENTS WITH INDIAN CORN.

Fodder corn was somewhat later in maturing this year, but the crop was an average one.

North Dakota White and Pearce's Prolific, the two varieties which seem most desirable for this part of the province, both reached the late milk or roasting stage on September 1. The fields of these varieties grown for ensilage gave a very satisfactory yield. The corn was cut with a binder, and allowed to wilt for several days before being put into the silos, and already the ensilage is giving off an agreeable, malty odor, indicating good quality.

The seed was sown on May 29, in rows 30 inches apart, using about half a bushel of seed per acre. The crop was cut on September 5. Thirty-four varieties were under trial. The soil was a rich, black loam, which had been summer-fallowed. The yield was calculated from two rows, each 66 feet long.

INDIAN CORN—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	Height.	Leafiness.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per acre grown in rows.		Weight per acre grown in hills.	
		In.							Tons.	Lbs.	Tons.	Lbs.
Thoroughbred White Flint......	Rank.	99	Leafy	Aug. 22	Aug. 31	Sept. 4	....	E. Milk..	23	860	20	260
Salzer's All Gold...	Fair..	111	Little	" 19	" 27	Aug. 31	Sept. 5	L. " ..	23	464	19	1,072
Yellow Long Eared	"	104	Leafy	" 13	" 20	" 29	" 1	L. " ..	21	1,956	17	716
N'rth Dakota White	"	81	Very leafy	" 16	" 22	" 27	Aug. 31	L. " ..	20	1,448	16	1,660
Pearce's Prolific....	Rank.	96	Leafy	" 12	" 18	" 25	Sept. 1	L. " ..	20	1,184	17	1,772
Sanford	Fair..	93	"	" 13	" 21	Sept. 4	....	E. " ..	20	920	14	1,436
Pride of the North.	"	96	Little	" 20	" 25	Aug. 27	....	E. " ..	20	656	19	1,600
Mammoth Eight Rowed Flint.....	Rank.	94	Leafy	" 12	" 20	Sept. 4	....	E. " ..	19	1,732	17	320
Extra Early Huron Dent............	Fair..	99	Little ...	" 17	" 25	Aug. 30	....	E. " ..	19	1,600	21	1,560
Red Cob Ensilage..	Rank.	115	Little	" 29	Sept. 5	....	....	Silk.....	19	1,600	20	1,052
Longfellow	"	99	Leafy ...	" 11	Aug. 17	Aug. 27	Sept. 5	L. Milk..	19	1,204	17	1,904
Salzer's Superior Fodder..........	Fair..	118	Fairly...	" 22	Sept. 5	....	....	Silk......	19	940	21	1,692
Mammoth Cuban..	Rank.	104	Little ..	" 22	Aug. 30	Sept. 5	....	E. Milk..	19	280	22	484
Giant Prolific Ensilage..........	"	101	Fairly....	" 27	" 31	" 5	......	E. " ..	18	1,752	18	1,752
Selected Leaming..	Fair..	107	Little ...	" 17	" 22	Aug. 28	Aug. 31	L. " ..	18	1,752	19	1,336
Champion White Pearl...	"	101	"	" 21	" 31	Sept. 4	......	E. " ..	18	1,356	18	960
White Cap Yellow Dent.............	"	106	Fairly....	" 18	" 26	Aug. 31	Sept. 5	L. " ..	18	1,224	17	1,772
Evergreen Sugar...	Rank.	87	Fairly....	" 20	" 30	Sept. 5	....	E. " ..	18	1,092	15	888
King of the Earliest	Fair..	90	Little	" 20	" 17	" 26	Aug. 31	L. " ..	18	564	17	848
Cloud's Early Yellow..............	"	113	"	" 21	" 27	" 4	......	E. " ..	18	300	20	656
Black Mexican.....	"	82	Fairly....	" 17	" 25	Aug. 30	Sept. 5	L. " ..	18	168	20	260
North Dakota Yellow..............	"	92	Very leafy	" 12	" 19	" 28	" 1	L. " ..	17	1,904	19	16
Early Butler..... .	"	96	Little.....	" 18	" 28	" 30	....	E. " ..	17	1,376	20	1,316
Early Mastodon...	"	108	"	" 21	" 30	Sept. 5	....	E. " ..	17	1,112	16	1,264
Compton's Early...	Rank.	90	Very leafy	" 11	" 18	" 27	Sept. 5	L. " ..	17	980	17	1,376
Kendall's Early Giant	Fair..	72	Fairly....	" 10	" 17	" 27	Aug. 31	L. " ..	17	452	15	96
Country Gentleman	"	78	Little	" 20	" 28	" 30	....	E. " ..	16	1,660	14	1,832
Canada White Flint	"	107	Leafy	" 12	" 20	" 29	Sept. 5	L. " ..	16	1,660	17	188
Angel of Midnight.	"	97	Very leafy	" 16	" 25	Sept. 3	....	E. " ..	15	1,152	15	1,548
Mitchell's Extra Early	Weak	62	Fairly....	" 2	" 7	Aug. 20	Aug. 28	L. " ..	14	512	16	1,396
Black Mexican.....	"	72	"	" 7	" 12	" 20	" 27	L. " ..	11	1,496	13	928
Salzer's Earliest Ripe	"	69	Slight....	" 2	" 7	" 16	" 25	L. " ..	11	1,364	16	1,264
Extra Early Szekely	"	80	Fairly....	" 7	" 10	" 20	" 27	L. " ..	11	704	9	84
Yellow Six-Weeks.	Fair..	69	Little	" 7	" 11	" 20	" 29	L. " ..	11	176	11	1,760

INDIAN Corn Sown at Different Distances Apart.

Name of Variety.	Distance between Rows.	Height.	Condition when Cut.	Weight per Acre, green, in Rows.	
	Inches.	Inches.		Tons.	lbs.
Longfellow	21	94	Early milk	16	1,616
"	28	94	"	16	1,377
"	35	94	"	16	1,943
"	42	94	"	17	603
Selected Leaming	21	101	"	19	527
"	28	101	"	15	1,538
"	35	101	"	15	548
"	42	101	"	15	548
Champion White Pearl	21	115	"	17	953
"	28	115	"	15	407
"	35	115	"	15	548
"	42	115	"	16	1,660

Average Yield at Different Distances Apart.	In Rows.	
	Tons.	lbs.
Average yield of green corn, 21 inches apart	17	1,698
" " 28 "	15	1,774
" " 35 "	16	346
" " 42 "	16	937

FIELD ROOTS.

All field roots, with the exception of carrots, have given large returns ; for some unexplained reason carrots were generally quite small.

EXPERIMENTS WITH TURNIPS.

Twenty-nine varieties of turnips were sown, but one of them, 'Webb's New Renown,' rotted in the ground and returns could not be obtained. With this exception the quality of the roots was excellent.

The soil chosen for these experiments was a sandy loam, which had been manured two years ago, and was summer-fallowed last year.

Two sowings were made of each variety, in every instance the early sown plots yielded considerably more than those later sown.

The first plots were sown on May 16, the second on May 30, and the roots from both were pulled on October 12. The estimate of yield has been made from the product of two rows each 66 feet long.

TURNIPS—TEST OF VARIETIES.

Name of Variety.	Yield Per Acre. — 1st Plot.		Yield Per Acre. — 1st Plot.		Yield Per Acre. — 2nd Plot.		Yield Per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Hall's Westbury	31	1,624	1,060	24	16	1,792	563	12
Hartley's Bronze	30	1,512	1,025	12	15	1,680	528	..
Prize Winner	30	720	1,012	..	17	320	572	..
Mammoth Clyde	27	1,704	928	24	15	360	506	..
Prize Purple Top	26	1,064	884	24	14	1,040	484	..
New Arctic	26	536	875	36	11	1,760	396	..
Sutton's Champion	26	272	871	12	13	400	440	..
Magnum Bonum	26	8	866	48	12	1,872	431	12
Imperial Swede	25	1,744	862	24	14	776	479	36
Kangaroo	25	424	840	24	9	1,536	325	36
Elephant's Master	24	1,368	822	48	10	328	338	48
East Lothian	24	576	809	36	12	552	409	12
Carter's Elephant	24	312	805	12	9	1,800	330	..
Perfection Swede	24	312	805	12	16	1,264	554	24
Bangholm Selected	23	1,784	796	24	13	1,984	466	24
Skirving's	23	464	774	24	14	1,040	484	..
Shamrock Purple Top	23	200	770	..	15	1,944	532	24
Jumbo	22	1,408	756	48	8	1,160	286	..
Halewood's Bronze Top	22	616	730	26	13	1,720	462	..
Monarch	21	1,560	726	..	13	400	440	..
Giant King	21	1,296	721	36	7	1,312	255	12
West Norfolk Red Top	20	920	682	..	11	1,760	396	..
Marquis of Lorne	19	1,864	664	24	11	176	369	36
Drummond Purple Top	19	280	638	..	6	1,200	220	..
Selected Purple Top	17	1,640	594	..	11	176	369	36
Selected Champion	17	1,640	594	..	12	1,872	431	12
Emperor	15	1.944	532	24	12	1,080	418	..
Champion Purple Top	14	1,568	492	48	13	1,984	466	24
Webb's New Renown	Completely		destroyed by		rot.			

EXPERIMENTS WITH MANGELS.

Twenty-five varieties of mangels were tested this year, and the yield was slightly above the average.

The seed of some of the varieties was washed out by a heavy rain, soon after sowing, leaving large vacancies in the rows. This accounts for the small return given by the last ten or twelve varieties. The soil on which the mangels were sown was a sandy loam, manured in 1899 and summer-fallowed last year.

Two sowings were made of each variety, the first on May 16, and the second on May 30, and the roots from both were pulled on September 24. The seed was sown in drills thirty inches apart, and the yield has been calculated from the weight of roots gathered from two rows each 66 feet long.

With four exceptions, the early sown plots gave the largest returns.

MANGELS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Half Long Sugar White	46	400	1,540	..	38	560	1,276	..
Mammoth Long Red	37	1,768	1,262	48	29	80	968	..
Selected Mammoth Long Red	37	1,240	1,254	..	26	272	871	12
Giant Yellow Globe	36	1,920	1,232	..	32	1,472	1,091	12
Norbiton Giant	35	488	1,174	48	20	128	668	48
Yellow Intermediate	34	1,168	1,152	48	13	1,720	462	..
Giant Yellow Intermediate	34	640	1,144	..	13	928	448	48
Half Long Sugar Rosy	32	680	1,078	..	24	1,368	822	48
Prize Mammoth Long Red	31	1,360	1,056	..	24	576	809	36
Triumph Yellow Globe	29	1,400	990	..	26	8	866	48
Gate Post	29	1,136	985	36	28	1,552	959	12
Mammoth Oval Shaped	28	760	946	..	19	1,600	660	..
Warden Orange Globe	28	232	937	12	17	1,904	598	24
Ward's Large Oval Shaped	27	384	906	24	22	88	734	48
Leviathan Long Red	26	800	880	..	21	240	704	..
Mammoth Yellow Intermediate	25	160	836	..	13	400	440	..
Gate Post Yellow	24	1,896	831	36	33	1,848	1,130	48
Lion Yellow Intermediate	24	1,104	818	24	20	920	682	..
Canadian Giant	21	504	708	24	34	640	1,144	..
Giant Yellow Half Long	21	240	704	..	18	960	616	..
Yellow Fleshed Tankard	19	1,600	660	..	19	1,864	664	24
Champion Yellow Globe	18	1,488	624	48	15	360	506	..
Golden Fleshed Tankard	18	432	607	12	25	1,480	858	..
Sutton's Yellow Globe	15	1,680	528	..	32	1,208	1,086	48
Red Fleshed Tankard	12	24	400	24	11	440	374	..

EXPERIMENTS WITH CARROTS.

The yield of carrots was a very irregular one, a few of the varieties giving large returns while others were scarcely an average crop.

The soil on which these roots were sown was a rich loam, summer-fallowed the previous year. The estimate of yield has been made from the roots produced on two rows each 66 feet long.

Nineteen varieties were tried. The first sowing was made on May 16, and the second on May 30. The seed was sown in drills eighteen inches apart, and all were pulled on October 12.

CARROTS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Giant White Vosges	21	240	704	..	12	1,080	418	..
Half Long White	20	480	674	40	15	800	513	20
Ontario Champion	20	480	674	40	13	840	447	20
White Belgian	19	1,600	660	..	13	1,720	462	..
New White Intermediate	19	1,600	660	..	12	640	410	40
Yellow Intermediate	17	1,640	594	..	11	880	381	20
Scarlet Intermediate	16	1,000	550	..	8	720	278	40
Long Yellow Stump Rooted	14	1,920	498	40	14	600	476	40
Iverson's Champion	14	1,920	498	40	14	600	476	40
Mamm. White Intermediate	11	880	381	20	17	1,200	586	40
Scarlet Nantes	10	1,560	359	20	7	960	249	20
Long Orange or Surrey	9	40	300	40	8	720	278	40
Long Scarlet Altringham	8	1,600	293	20	7	80	234	40
Carter's Orange Giant	7	1,400	256	40	14	1,920	498	40
Green Top White Orthe	6	760	212	40	16	1,880	564	40
Half Long Chantenay	6	320	205	20	13	1,720	462	..
Guerande or Ox-heart	5	1,880	198	..	16	1,000	550	..
Early Gem	4	1,240	154	..	13	840	447	20
White Vosges Large Short	......	......	......	......	14	1,480	491	20

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of Sugar Beets were tested. The soil was a sandy loam, manured in 1899, and summer-fallowed last year. The first plots were sown on May 16, and the second on May 30, and all were pulled on September 24. The yield per acre has been calculated from two rows each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Red Top Sugar	30	984	1016	24	29	1,136	985	36
Danish Red Top	29	344	972	24	28	232	937	12
Danish Improved	27	1,704	928	24	28	496	941	36
Wanzleben	25	160	836	..	22	1,672	761	12
Vilmorin's Improved	20	1,184	686	24	18	1,752	629	12
Royal Giant	18	960	616	..	18	696	611	36
Improved Imperial	18	960	616	..	26	1,856	897	36

EXPERIMENTS WITH POTATOES.

The season has been an exceptionally favourable one for potatoes. The abundant rainfall in late summer and the open fall encouraged rank growth of both vine and tuber.

The quality of the product was also above the average, many of the varieties being so dry that it was found difficult to boil them.

Formerly when small two-eye sets were used, some difficulty has been experienced from uneven germination, many sets failing to grow. For the past two years large sets have been used with excellent results, the germination being almost perfect.

The average yield of twelve of the most productive varieties covering a period of five years is also given.

The previous crop was pease. There was no injury from rot, and practically all were marketable.

The yield per acre has been estimated in each case from the product of one row 66 feet long.

All the varieties were planted on May 18, in rich clay loam, without manure, and were dug on October 5.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Total Yield per Acre.		Form and Colour.
					Bush.	Lbs.	
Hale's Champion......	Fair......	Sept. 1..	Medium..	Fair......	737	..	Roundish, oval, white.
I. X. L...............	Rank	Not ripe..	" ..	Good.....	623	20	Long, round, light pink.
Sabean's Elephant	"	" ..	Small	Poor	619	40	" round, white.
Columbus......... ...	" ...	" ..	Medium..	Fair.. ...	616	..	" oval, deep pink.
Daisy................	"	Sept. 1..	" ..	"	597	40	" " light pink.
State of Maine........	"	Not ripe..	" ..	"	597	40	Flattish oval, white.
Prolific Rose..........	"	Sept. 1..	Small	Good.....	590	20	Roundish, oval, deep pink.
American Wonder	"	Not ripe..	Medium..	Fair.	586	40	Long, round, white.
Brown's Rot Proof.....	"	" ..	" ..	"	575	40	Round, oval, deep pink.
Reeve's Rose...........	"	" ..	" ..	"	575	40	Flat oval, light pink.
Burnaby Seedling......	" ...	" ..	" ..	Good... .	561	..	" "
White Beauty........	"	Sept. 1..	" ..	"	553	40	" white.
Early Pride.	"	" 1..	" ..	Fair......	550	..	" light pink.
Brownell's Winner....	"	Not ripe.	" ..	"	546	20	Irregular deep pink.
Enormous	" ...	" ..	Small.....	Poor	542	40	Roundish white.
Vigorosa.	"	Sept. 1..	Medium..	Fair......	539	..	Long, round light pink.
Extra Early Harvest..	"	Not ripe..	" ..	Good.....	539	..	Roundish, white.
Carman No. 1..... ...	"	" ..	" ..	Poor	539	..	Flat, white.
Rose No. 9............	"	" ..	Small	"	531	40	Long, flat, deep pink.
Bill Nye	"	Sept. 1..	Medium..	"	520	40	Roundish oval, white.
Money Maker	"	" 1..	" ..	Fair......	520	40	Round, oval white.
Wonder of the World .	"	" 1..	" ..	Good.....	517	..	" oval, light pink.
Lizzie's Pride.........	"	Not ripe..	" ..	Poor	517	..	Irregular white.
Quaker City	Fair	" ..	" ..	"	513	20	Long, flat, white.
Maule's Thoroughbred.	Rank	" ..	" ..	Good.....	513	20	" oval, deep pink.
Vanier........... .. .	" ...	" ..	Small	"	509	40	Roundish oval, deep pink.
Dreer's Standard......	"	" ..	Medium..	"	509	40	Flattish oval, white.
Northern Spy.........	"	" ..	" ..	Fair......	506	..	Long, flat, deep pink.
American Beauty.....	"	" ..	Large	Good.....	506	..	" white.
Seedling No. 7...	"	" ..	"	Fair......	506	..	Long, oval, deep red.
American Giant.......	"	Sept. 1..	"	"	502	20	Roundish oval, white.
Clarke's No. 1........	"	Not ripe..	Medium..	Poor	498	40	Long, flat, light pink.
Good News......... ..	"	" ..	" ..	Good.....	498	40	" round, deep pink.
Early Norther........	"	Sept. 1..	" ..	"	498	40	" flat, pink.
Pearce's Extra Early..	"	Not ripe..	" ..	"	495	..	" " deep pink.
Country Gentleman...	"	Sept. 1..	Large	"	491	20	" deep pink.
Uncle Sam............	"	Not ripe..	Medium..	Poor.	487	40	Flattish, oval white.
Empire State..........	"	" ..	Large	Good.....	484	..	Long, round, white.
Maggie Murphy.	"	" ..	Medium..	"	484	..	Flattish, oval, light pink.
Swiss Snowflake......	Fair......	" ..	" ..	"	480	20	Irregular, white.
Early Puritan.	Rank	" ..	" ..	"	480	20	Long, round, white.
Late Puritan.,........	"	" ..	Small	Fair.. ...	476	40	Long, round, white.
Irish Cobbler	Weak	Sept. 1.	Large . ..	Poor	476	40	Flattish, white.
General Gordon.......	Rank	Not ripe..	Medium..	"	476	40	Long, round, deep pink.
Rural Blush..........	"	" ..	" ..	Good.....	473	..	Round, oval, deep pink.
Cambridge Russet.....	"	Sept. 1..	Small	"	473	..	Long, round, deep russet.
Canadian Beauty	"	Not ripe..	Medium..	Fair......	473	..	" " light pink.
Clay Rose	"	" ..	" ..	Good.....	469	20	Flat, oval, deep pink.
New Queen............	"	Sept. 1..	" ..	"	469	20	Long, round, light pink.

POTATOES—TEST OF VARIETIES.

Name of Variety.	Character of Growth.	When Matured.	Average Size.	Quality.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
Chas. Downing..	Rank	Sept. 1..	Small	Good.....	465	40	Flattish oval, white.
Seedling No. 230	"	Not ripe..	Medium..	Fair......	465	40	Roundish oval, white.
Houlton Rose.........	"	Sept. 1..	Large	Good.....	465	40	Long, round, white.
Great Divide..........	"	Not ripe..	Medium..	"	462	..	Irregular, white.
Everett.........	" ...	" ..	" ..	"	462	..	Long, oval, deep pink.
World's Fair..........	"	Sept. 1..	Small	"	462	..	Flattish white.
Bovee................	" ...	" 1..	Medium..	Fair......	462	..	Long, oval, light pink.
Penn Manor..	" ...	" 1..	" ..	Good.....	462	..	" deep pink.
Early White Prize....	"	" 1..	" ..	"	458	20	Round, oval, light pink.
Harbinger............	"	" 1..	" ..	"	454	40	Roundish oval "
Early Rose..........	"	" 1..	" ..	"	440	..	" "
Stourbridge Glory	"	Not ripe..	" ..	Fair......	440	..	Oval, white russet.
Pearce's Prize Winner.	"	Sept. 1..	Small	Good.....	432	40	Flattish oval, white.
Delaware.....	"	" 1..	Medium..	Fair......	425	20	Long, oval, white.
Beauty of Hebron.....	"	" 1..	" ..	Good.....	425	20	" round, light pink.
20th Century..........	"	" 1..	Large	Fair......	425	20	" " deep russet.
Dakota Red.........	"	Not ripe..	Medium..	"	425	20	" flat, deep pink.
Early St. George......	" ...	" ..	Large	Good.....	421	40	" oval, deep pink.
Pride of the Market...	" ...	" ..	Medium..	"	421	40	Roundish oval, white.
Chicago Market......	"	Sept. 1..	" ..	Fair......	421	40	Long, round, white.
Rawdon Rose.........	"	" 1..	" ..	Good.....	418	..	Roundish oval, light pink.
Carman No. 3.........	"	" 1..	" ..	"	418	..	Long, round, white.
Lightning Express....	"	" 1..	" ..	"	418	..	Flattish, light pink.
Algoma	"	" 1..	" ..	"	414	20	" oval, deep pink.
Lee's Favorite	"	" 1..	Small	"	414	20	Long, oval, light pink.
New Variety No. 1....	Fair......	Not ripe..	Large	"	414	20	Irregular, white.
Irish Daisy...........	Rank	Sept. 1..	Medium..	"	414	20	Long, oval, white.
Green Mountain......	Fair......	Not ripe..	" ..	"	414	20	Flattish oval, white.
Holborn Abundance...	Rank	" ..	Small	"	414	20	Round, white.
Early Michigan.......	"	Sept. 1..	Medium..	"	410	40	Long, flat, white.
Reading Giant........	"	" 1..	Small	"	403	20	Roundish oval, deep pink.
Thorburn	Fair......	" 1..	Medium..	"	403	20	" light pink.
Early Market.........	Rank	" 1..	" ..	"	399	40	Round, oval.
Sir Walter Raleigh....	"	Not ripe..	Small	"	396	..	Flattish oval, white.
Russell Seedling	"	" ..	"	"	392	20	" "
Early Six Weeks......	Fair......	Sept. 1..	Medium..	"	392	20	Round, light pink.
Vick's Extra Early....	Rank	" 1..	Small	"	388	40	Flat, pink.
Flemish Beauty......	"	Not ripe..	Medium..	" ..	388	40	Oval, deep pink.
Troy Seedling.........	"	" ..	Small	"	381	20	Irregular, white.
Seneca Beauty........	"	" ..	Medium..	"	381	20	Round, deep pink.
Burpee's Extra Early..	"	Sept. 1..	Small	Fair.....	377	40	Roundish oval, light pink.
Record.	"	Not ripe..	"	Good.....	377	40	Long, round, white.
McIntyre..............	Fair......	" ..	"	Poor......	377	40	" "
Prize Taker...........	Rank	Sept. 1..	"	Fair......	374	..	Roundish oval, deep pink.
Honeoye Rose	"	" 1..	Large	Poor	366	40	" light pink.
Rochester Rose........	Fair......	" 1..	Small .. .	Good.....	352	..	Long, round, light pink.
Rural No. 2..........	Rank	" 1..	Large	"	352	..	Flattish oval, white.
Polaris...............	"	" 1..	" .. .	"	344	40	Long oval, deep pink.
Early Fortune	Weak	" 1..	Medium..	"	344	40	Roundish, oval, deep pink.
Livingstone...... ..	Fair......	Not ripe .	" ..	"	344	40	" white.
Seattle...............	Rank	Sept. 1..	Large	"	337	20	Long, flat, light pink.
Early Ohio..........	Weak	" 1..	Medium..	"	333	40	Round, oval, light pink.
Fill Basket.	"	Not ripe..	" ..	"	330	..	" deep pink.
Early Sunrise.........	"	Sept. 1..	Large	"	326	30	Long, oval, light pink.
Sharpe's Seedling.....	Fair......	" 1..	Medium..	"	311	40	" "
Ohio Junior	Weak	" 1..	" ..	"	311	40	Roundish oval, light pink.
Earliest of All........	Rank	" 1..	Large	Fair......	308	..	Long oval, light pink.
Up to Date.....	Weak	Not ripe .	Small	"	212	40	Flattish round, white.
Early Andes..........	"	Sept. 1..	Medium..	Good.....	209	..	Roundish oval, white.

AVERAGE Results of a Five Years' Test of Twelve Varieties of Potatoes.

Variety.	Years included.	Average Yield per Acre.	
		Bush.	Lbs.
Seedling No. 7	1897-98-99-1900-1901	402	36
Delaware	1897-98-99-1900-1901	393	4
Carman No. 1	1897-98-99-1900-1901	390	8
Clarke's No. 1	1897-98-99-1900-1901	382	48
Money Maker	1897-98-99-1900-1901	368	8
Lizzie's Pride	1897-98-99-1900-1901	365	12
New Variety No. 1	1897-98-99-1900-1901	365	12
Brownell's Winner	1897-98-99-1900-1901	352	44
Dakota Red	1897-98-99-1900-1901	344	40
Troy Seedling	1897-98-99-1900-1901	340	16
Seedling No. 230	1897-98-99-1900-1901	327	4
Carman No. 3	1897-98-99-1900-1901	321	56

GRASSES.

The season has been a very favourable one for all varieties of grass, the area devoted to this crop has been largely increased on the farm, but most of the plots and fields have been seeded some time and the yields for that reason are not very heavy. All were sown in June without a nurse crop.

Variety.	Area.	When Sown.	Yield per Acre.	
	Acres.		Tons.	Lbs.
Brome Grass	$3\frac{3}{4}$	1898	2	1,658
"	$\frac{1}{10}$	1899	2	1,200
Timothy	$\frac{1}{10}$	1899	1	200
Western Rye Grass	10	1900	3	....

CLOVERS.

When sown with a nurse crop of grain even the hardier varieties of clover only produce in this country small weak plants, which are almost invariably winter killed, but if sown alone, either on ploughed stubble or summer-fallow, and the weeds kept mowed during the summer, the plants become sufficiently strong to withstand the winter, and give a fair return the following summer.

Perhaps the best clover for general cultivation in the western portion of the province is Alfalfa or Lucerne. This should be sown on land free of grass or perennial weeds, in the proportion of thirty pounds of seed per acre. The mower should be run over the land several times during the first year to destroy all annual weeds before they go to seed and the perennial weeds should be hoed or pulled out. The young clover plants are very weak during the first year and must have every opportunity of growing.

The greatest obstacle to clover growing on this farm is the ground or pocket squirrel. This small animal is very fond of clover roots, and if not caught, soon destroys a large proportion of the plants. As they seldom appear above the surface, their run-ways require to be opened ; a spring trap set below the surface of the ground and covered with a board to exclude the light ; by this plan they are generally caught in a short time.

Mammoth Red, Common Red and Alsike were grown during the past year for ploughing under, but only Alfalfa or Lucerne was grown for hay. A one-twentieth acre of this variety yielded in the proportion of 1 ton 300 pounds of dry hay per acre in one cutting. It is usual to make two cuttings each year of Alfalfa, but the first cutting was delayed so long owing to the wet weather that there was not time for a second cutting to grow. Alfalfa should be cut on the first appearance of blossom. If the cutting is delayed after this date the plants become woody and the second cutting is greatly lessened.

MILLETS.

Eight varieties of millet were sown on May 31, in plots of 1-20 acre, but not enough of the seed germinated to make a stand of plants, and the experiment was of no value. On June 8, a second sowing was made of Japanese and Common Millet, the only varieties of which we had seed. As rains were frequent at this time the germination was rapid and a very fair crop was harvested.

The size of the plots was 1-10 acre, the soil a rich clay loam, which had been summer-fallowed.

Both varieties were sown with an ordinary grain drill, 6 inches apart.

Variety.	When Sown.	When Cut.	Yield per Acre.	
			Bush.	Lbs.
Japanese	June 8	Sept. 10	3	1,400
Common	June 8	Sept. 10	2	1,760

SUNFLOWERS.

A 1-40 acre plot of Mammoth Russian Sunflowers was sown on May 31, and cut on October 10. The height was seven feet, and the yield 1 ton 1,000 pounds of heads per acre. The soil was a clay loam summer-fallowed.

CATTLE.

The herd of cattle on the Brandon farm now consists of the following animals :—

Name of Animal.	Breed.	Age.	Weight.
			Lbs.
Lord Lossie	Shorthorn	4 years	2,220
Violet	"	4 "	1,185
Mary of Brandon	"	2 "	930
Esther	"	4 "	1,295
Prairie Buttercup	"	19 months	790
Eva	"	17 "	730
Sheba of Brandon	"	7 "	470
Roxy of Brandon	"	4 "	290
Prince Charlie	Ayrshire	18 "	980
Primrose	"	3 years	1,195
Bonnie Doon	"	22 months	880
Hugh John	"	22 "	1,090
Siepkje of Brandon	Holstein	3 years	1,290
Richard Lyons	Guernsey	4 "	1,925
Lady Jane Grey	Grade	13 "	1,260
Pansy	"	7 "	1,297
Rose	"	14 months	795
Reddy (steer)	"	3 years	1,310
Dick "	"	2 "	1,200
Pearl	"	6 months	400

MILKING COWS.

The accompanying table gives the length of the milking period and the weight of milk given, by a number of the Experimental Farm cows for the past few years.

Name of Cow.	Age.	Breed.	Milking Period.	Pounds Milk.
	Yrs.			
Violet	4	Shorthorn	291 days ending April 21, 1900	2,834
"	5	"	277 " Mar. 16, 1901	3,331
Esther of Smithfield 3rd	4	"	350 " Mar. 16, 1901	4,837
Princess Lida 2nd	6	Holstein	313 " May 24, 1895	8,483
"	8	"	531 " Nov. 17, 1897	7,517
Lida of Brandon	3	"	341 " Dec. 11, 1897	7,336
"	5	"	387 " Feb. 28. 1899	8,261
Siepkje 3rd Queen	11	"	261 " Jan. 5, 1899	7,170
Lida's, Princess of Brandon	4	"	301 " Jan. 9, 1900	6,054
" "	5		332 " June 15, 1901	4,967
Dandy	7	Ayrshire	442 " Mar. 14, 1896	9,167
Pansy	3	Ayrshire Grade	314 " Aug. 14, 1897	5,124
"	4	"	373 " Oct. 7, 1898	5,245
"	6	"	358 " April 22, 1900	8,252
Violet	5	Shorthorn Grade	155 " Feb. 17, 1900	1,085
"	6	"	277 " Mar. 16, 1901	3,331
Lady Jane Grey	9	Grade	311 " Feb. 23, 1897	6,815
"	10	"	306 " Mar. 19, 1898	7,492
"		"	348 " May 2, 1899	8,094
"		"	179 " Dec. 7, 1899	5,705
"		"	305 " Feb. 21, 1901	7,416

EXPERIMENTS IN FEEDING STEERS.

DEHORNING AND ITS EFFECT ON CATTLE.

This experiment was a continuation of a similar one made last year, particulars of which can be found on page 363 of last year's annual report.

The steers were apparently all three years old, Shorthorn and Hereford grades, very uniform in quality and size.

The dehorning was done with a sharp carpenter's saw, as described in last year's report, and the operation was a success with all but one of the animals. This steer having a deformed horn, the cutting had to be done very close to the head, causing a profuse bleeding. This stopped in an hour or two, but broke out again during the night, and the animal was found dead in the morning. While it is thought to be an advantage to cut the horns moderately close to the head, it is, apparently, possible to cut too close. Cutting done on a level with the roots of the hair surrounding the horn has given us good results here.

Owing to the above accident, only four steers were used in each group, instead of five, as in last year's test. Two of the groups were dehorned, and one was not dehorned.

One of the dehorned groups was fed in a stall, loose, while the other was tied up alongside of the group with the horns.

The eight animals were tied in double stalls with chains ; the four united animals were confined in a stall, 10 feet by 28 feet, and were fed in a trough running the length of the stall.

When purchased, in November, 1900, the steers cost $3.25 per hundred pounds, and they sold on April 20, 1901, for $4.60 per hundred pounds.

This experiment, like the one conducted last year, would lead us to the conclusion that dehorning has very little effect on the fattening of the animals.

RATION FED.

During the first four weeks, Nov. 30 to Dec. 28, 1900, each steer received per day:

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	7
Bran	5

During second four weeks, Dec. 28 to Jan. 25, each steer received per day:

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	7

During third four weeks, Jan. 25 to Feb. 22, 1901, each steer received per day:

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	9

During fourth four weeks, Feb. 22 to March 22, 1901, each steer received per day:

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	11

During fifth four weeks, March 22 to April 19, 1901, each steer received per day:

	Lbs.
Straw	10
Ensilage	23
Chop	11

DESCRIPTION OF FODDER.

The straw was a mixture of wheat and oats. The fodder corn was made from early ripening varieties, well cured in stooks outside, and only drawn in as wanted. The chop consisted of one-third each of wheat screenings, oats and barley, and the ensilage was made from early ripening varieties of corn.

COMPARATIVE GAINS.

Horned and Tied Up.	Date.	Weight.	Gain.	Total Gain.
Original weight	Nov. 30	4,645 lbs.		
Weight end of 1st period	Dec. 28	4,875 "	230 lbs.	
" 2nd "	Jan. 25	4,995 "	120 "	
" 3rd "	Feb. 22	5,160 "	165 "	
" 4th "	Mar. 22	5,420 "	260 "	
" 5th "	April 18	5,497 "	77 "	852 lbs.

COMPARATIVE GAINS—*Concluded.*

Dehorned—Tied.	Date.	Weight.	Gain.	Total Gain.
Original weight	Nov. 30	4,650 lbs		
Weight end of 1st period	Dec. 28	4,796 "	146 lbs.	
" 2nd "	Jan. 25	4,889 "	93 "	
" 3rd "	Feb. 22	4,980 "	91 "	
" 4th "	Mar. 22	5,215 "	235 "	
" 5th "	April 18	5,290 "	75 "	640 lbs.

Dehorned—Loose.	Date.	Weight.	Gain.	Total Gain.
Original weight	Nov. 30	4,595 lbs		
Weight end of 1st period	Dec. 28	4,801 "	206 lbs.	
" 2nd "	Jan. 25	4,975 "	174 "	
" 3rd "	Feb. 22	5,075 "	100 "	
" 4th "	Mar. 22	5,367 "	292 "	
" 5th "	April 18	5,447 "	80 "	852 lbs.

COST OF FEEDING EACH LOT OF FOUR STEERS.

5,600 pounds of straw at $1 per ton	$ 2 80
2,240 pounds of corn fodder at $4 per ton	4 48
11,536 pounds of ensilage at $2 per ton	11 53
5,040 pounds of chop at 75 cents per hundred	37 80
560 pounds of bran at $10 per ton	2 80
	$59 41

SUMMARY OF RESULTS.

—	First Cost of Steers.	Value of Feed Consumed.	Price Sold for.	Profit.
Horned	$150 96	$59 41	$252 86	$42 49
Dehorned—tied	151 12	59 41	243 34	32 81
" loose	149 33	59 41	250 56	41 82

SPELTZ AS FEED FOR STEERS.

As stabling is somewhat limited on the Experimental Farm, only four steers could be used in this experiment. All were three-year-old Shorthorn grades, uniform in size and quality.

They were purchased in November, 1900, for $3.25 per hundred pounds, live weight, and were sold in April for $4.60 per hundred pounds.

All were tied in double stalls and fed a similar ration except that one group received chop composed of one-third oats, one-third wheat screenings and one-third barley, and the other group received an equal quantity of chopped Speltz, which was ground with the chaff on.

It will be noticed that the steers fed on Speltz made a somewhat larger profit than those fed on mixed grain.

Ayrshire Grade Cow Pansy.

Shorthorn Grade Cow Violet.

Comparative Gains.

Steers Fed on Speltz.	Date.	Weight.	Gain.	Total Gain.
Original weight	Dec. 28	2,502 lbs.		
Weight end of 1st period	Jan. 25	2,582 "	80 lbs.	
" 2nd "	Feb. 22	2,632 "	50 "	
" 3rd "	Mar. 22	2,765 "	133 "	
" 4th "	April 18	2,810 "	45 "	308 lbs.

Steers Fed on Mixed Grain.	Date.	Weight.	Gain.	Total Gain.
Original weight	Dec. 28	2,497 lbs.		
Weight end of 1st period	Jan. 25	2,542 "	45 lbs.	
" 2nd "	Feb. 22	2,560 "	18 "	
" 3rd "	Mar. 22	2,675 "	115 "	
" 4th "	April 18	2,725 "	50 "	228 lbs.

Cost of Feeding Each Lot of Two Steers.

2,240 pounds of straw at $1 per ton	$ 1 12
840 pounds of corn fodder at $4 per ton	1 68
4,648 pounds of ensilage at $2 per ton	4 65
2,128 pounds of chop at 75 cents per hundred	15 96
	$23 41

Summary of Results.

—	First Cost of Steers.	Value of Feed Consumed.	Price Sold for.	Profit.
Steers fed on speltz	$81 31	$23 41	$129 26	$24 54
Steers fed on mixed grain	81 12	23 41	125 35	20 82

Speltz as Feed for Steers.

During first four weeks, Dec. 28 to Jan. 25, each steer received per day :

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	7

During second four weeks, Jan. 25 to Feb. 22, 1901, each steer received per day :

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	9

During third four weeks, Feb. 22 to March 22, 1901, each steer received per day:

	Lbs.
Straw	10
Corn fodder	5
Ensilage	20
Chop	11

During the fourth four weeks, March 22 to April 19, 1901, each steer received per day:

	Lbs.
Straw	10
Ensilage	23
Chop	11

Brome Grass Pasture for Steers.

The field selected for this purpose was seeded to brome grass, on summer-fallow, in August, 1898. The area was one acre. Four pigs were pastured on it during 1899 and 1900, and any grass they did not consume was cut and made into hay.

One of the animals was a Shorthorn grade, twenty-three months old, and weighing 1,090 pounds on May 8, when the experiment was commenced, the other was a Guernsey grade twenty-one months old, and weighing 980 pounds.

Both steers were kept closely confined to the field from May 8 to August 28. A small building afforded them shelter during severe storms.

Water was given them twice a day, but no grain or other feed in addition to the pasture. There was abundant pasture for the steers until August 28, when it became very short and the cattle were removed.

The accompanying tables give particulars of this experiment.

Comparative Gains.

Shorthorn—Grade Steer 'Reddy.'	Date.	Weight.	Gain.	Total Gain.
		Lbs.	Lbs.	Lbs.
Original weight	May 8	1,090	....	
Weight end of 1st four weeks	June 5	1,215	125	
" 2nd "	July 3	1,250	35	
" 3rd "	" 31	1,300	50	
" 4th "	Aug. 28	1,335	35	245
Guernsey—Grade Steer 'Dick.'				
Original weight	May 8	980	....	
Weight end of 1st four weeks	June 5	1,080	100	
" 2nd "	July 3	1,130	50	
" 3rd "	" 31	1,190	60	
" 4th "	Aug. 28	1,225	35	245

Total gain for the two steers on one acre of brome grass pasture for four months equals 490 pounds, at 3½ cents per pound, equals $17.15.

BULL SERVICE.

The bulls on the Experimental Farm have all been available for service to the farmers and others at a nominal figure. This privilege has been readily taken advan-

tage of, with the result that the stock in this neighbourhood has greatly improved in character since the establishment of the Experimental Farm.

During the past two years, the three bulls on the farm have served 193 cows. This is in addition to the Experimental Farm herd. Eighty-two cows were served by the Shorthorn, 72 by the Guernsey, and 39 by the Ayrshire.

Importance of the Sire.

A very striking instance of the prepotency of the sire is shown in the form and milking record of the two grade cows 'Violet' and 'Pansy.' These were both from the same grade cow, 'Daisy.' Violet's sire was a beefy Shorthorn bull, and Pansy's a large Ayrshire bull. Both take after their respective sires in appearance. The plate near the beginning of this report was made from photographs of these animals. From the accompanying table, it will be seen that the Ayrshire-grade, not only gave the largest quantity of milk per day, but her milking period was also much longer.

Name of Cow.	Breed.	Milking Period.	Pounds Milk.	Number Days.	Milk per Day.	
					Lbs.	Oz.
Violet	Shorthorn—Grade	Aug. 10, 1899 to Feb 17, 1900.	1,076	191	5	10
Pansy	Ayrshire—Grade	Sept. 29, 1897 to Oct. 7, 1898.	5,241	373	14	..
Violet	Shorthorn—Grade	Aug. 15, 1900 to Jan. 17, 1901	1,085	155	7	..
Pansy	Ayrshire—Grade	Apl. 29, 1899 to Apl. 22, 1900	8,252	358	23	..

SWINE.

The herd of swine on the farm continues in good health, and consists of the following animals :—

Name.	Breed.	Age.
Royal Victor	Berkshire	3 years.
Neepawa Bob	"	10 months.
Minnie Merle 3rd	"	2 years.
Three pigs	"	3 months.
Amy's Choice 2nd	Tamworth	3 years.
Nina of Brandon	"	3 "
Brandon Princess	Improved Yorkshire	8 months.
Brandon Chief	" "	7 "
Four Cross-breds	Berkshire Sow x Tamworth Boar	

POULTRY.

The fowls have kept quite healthy, and seventy chicks were raised during the year.

The flock now consists of 48 Light Brahmas, 13 White Plymouth Rocks and 21 Black Minorcas.

Fattening of Brahmas Compared with Plymouth Rocks.

Four Brahmas and an equal number of White Plymouth Rocks were shut up in slatted pens, each 2 x 3 feet, and fed all they would eat of finely-ground grain, consisting of one-third each of oats, wheat and barley. This was given, in troughs, mixed with skim milk to about the consistency of thin porridge.

In the estimate of cost, the meal has been valued at $1 per hundred pounds.

From the accompanying tables, it will be seen that the Brahmas produced the cheapest meat by one-third of a cent per pound. The Plymouth Rock fowls presented the best appearance, being more plump and shapely than the Brahmas.

LIGHT BRAHMAS.

Weight September 24.		Weight October 8.		Weight October 22.		Gain.		Cost.	Cost Per Pound Live Weight.
Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Cents.	Cents.
20	9	25	8	29	11	9	2	34	$3\frac{2}{3}$
WHITE PLYMOUTH ROCKS.									
18	5	22	12	26	5	8	..	32	4

OATS COMPARED WITH MIXED GRAIN AS A FATTENING RATION.

Eight Light Brahmas were used for this test. They were divided into two lots, nearly equal in weight, and shut up in separate feeding pens. One pen was fed with oats alone, ground fine and mixed with skim milk ; the other pen was fed with grain, consisting of one-third each of oats, wheat and barley.

The accompanying table shows that the pen fed with oats made the greatest gain and at the least expense.

Grain Fed.	Weight November 2.		Weight November 22		Gain.		Cost.	Cost Per Pound Live Weight.
	Lbs.	Oz.	Lbs.	Oz.	Lbs.	Oz.	Cents.	Cents.
Oats....................................	23	11	32	..	8	5	31	$3\frac{7}{10}$
Mixed grain............................	23	13	31	4	7	7	29	$3\frac{9}{10}$

BEES.

Of the eight colonies of bees placed in the cellar last winter, six wintered safely, and two died from diarrhœa. These two hives were located close to, but not touching, an outside stone wall, and the frames were quite damp and mouldy in the spring. One of the hives lost its queen during the winter or early spring. This fact was first discovered by noticing that the bees failed to gather pollen. A queen was at once procured from the south and introduced by means of the shipping case. The bees adopted her at once, quickly became populous, and this colony was one of the largest producers on the farm.

With one exception, the colonies on the Experimental Farm have been kept for years without intermixture from outside sources, and they are exceedingly tame ; but one colony, supplied with an imported queen this year, is decidedly cross and attacks the attendant on the least provocation. It will be interesting to watch the effect of continued gentle treatment on this colony.

The hives were placed on their summer stand on April 19, and at once worked freely on willow and poplar blossom.

Although a part of the season was too cloudy and wet for the best results, the months of July and August were bright and sunny, and the yield of honey for the season averaged 30 pounds per hive, spring count. The quality of the honey was excep-

tionally good, and found ready sale at from 10 to 15 cents per pound for the extracted article.

The honey of this province is very largely obtained from wild flowers, and seldom varies in quality during the season. Nearly all the surplus is gathered during the months of July and August, the other months yielding only sufficient to keep up breeding.

Seven additional swarms were hived during the summer. Six of these were July swarms and one in August. All these became strong before winter, and the early July swarms were among the most productive colonies of the year.

The first extracting was done on July 22, and the first drones were killed on September 9. It is found advisable to place the summer stands among the shelter of trees and only about 4 inches from the ground. This enables the heavy laden bees to reach their hive readily, and saves considerable loss from the strong winds prevailing here.

Although our winters are usually very long, there is generally very little trouble in wintering bees in this province, providing the cellar is dry and dark and the temperature is kept from 35 to 45 degrees. In the fall, before placing the bees in the cellar, the temperature should be carefully ascertained, and unless below 50 degrees, the bees should not be moved from their summer stand until the cellar has cooled. A high temperature causes uneasiness and much loss.

HORTICULTURE.

GENERAL REMARKS.

Notwithstanding some drawbacks, the past season has certainly been a favourable one from a horticultural standpoint. The condition of the soil in the spring was favourable to early germination, and early sown vegetables, such as onions, lettuce, &c., progressed rapidly, a necessary essential to success in the case of vegetables requiring a long growing season. During May, we experienced a long spell of hot and dry weather, the thermometer registering as high as 95 degrees Fahr. in the shade. On the evening of May 24, the thermometer dropped to 28 Fahr., but the only noticeable damage from this cause was the curling of the leaves of the Native Ash (*Fraxinus pennsylvanica lancelolata*) and the Native Oak (*Quercus macrocarpa*). A continued low temperature from this date culminated in a heavy rainfall on June 3 (·94 of inch), and, with a still falling temperature, we were visited with another heavy rain on the evening of the 5th, which changed during the night to snow, loading the branches of the trees so heavily as to break a considerable number of them, also badly smashing the stems of the taller-growing varieties of herbaceous perennials. The most serious damage in this connection was sustained by the hedges, in many instances the centres being laid open, and pruning had to be exercised judiciously throughout the balance of the season in order to overcome the effects. The morning of June 6 was bright, and the snow rapidly disappeared, but unfortunately the thermometer fell in the evening to 27·5 Fahr., seriously reducing a splendid set of plums and crab apples, and totally destroying corn, cucumbers, beans and squash, together with many of the newly bedded annual flowers.

The remainder of the season was all that could be desired, and the comparatively long, open fall compensated for much of the damage done early in the season, and, as an instance of the wonderful rapidity of growth here, the cucumbers, squash, &c., that were destroyed by frost and resown as late as June 7, produced a large crop early in August, results equal to previous years when sown on May 10.

All tree seeds germinated well, and a feature of the season was the luxuriant growth made by both fruit and forest trees, some specimens of the native maple (*Acer negundo*) showing six feet of new wood.

APPLES, 1901.

TRANSCENDENT CRAB.

The two trees of this variety growing on the farm were covered with blossom, and a fine crop of fruit set. Unfortunately, the frost of June 6 completely destroyed it, and no fruit was harvested. A number of scions were taken from these trees during the autumn, which will be used as grafts on *Pyrus baccata* next spring.

PYRUS BACCATA.

There was a large set of a number of varieties of this crab apple, but the frost previously referred to seriously reduced the quantity, though fortunately, enough specimens remained uninjured to allow of a comparison of varieties.

The greater portion of these wild forms were very small, but the following were superior enough to warrant propagation :—

Pyrus baccata sanguinea.—Colour, rosy red, when ripe ; ripe August 20 ; depth, 1 inch ; flavour, fairly sweet, and not very astringent.

Pyrus baccata lutea.—Colour, a deep yellow ; ripe August 18 ; depth, ⅝ inch ; inch ; flavour acid, but palatable.

Pyrus baccata prunifolia.—Colour, deep green, with slight rosy shade on sunny side ; depth, ⅞ of an inch ; flavour palatable, but dry.

Pyrus baccata yellow.—Colour, light yellow ; ripe August 20 ; depth, ¾ of an inch ; flavour acid, but palatable.

The above varieties would make good preserves, and, as their hardiness is unquestionable, they deserve to be generally grown. It is intended to use those smaller fruiting varieties as stocks as fast as superior scions are available.

The following additional varieties of *Pyrus baccata* were received during the past season and planted in a new orchard on the hillside :—

Variety.	Number Received.	Number Alive Fall 1901.
Pyrus prunifolia A A 3548	4	2
" spectabilis floribunda Schendeckeri	4	4
" " A A 1615	4	4
" malus A A	8	7
" " pendula A A	6	4
" " A A 139—1	4	4
" latulœfolia	4	3
" malus orthocarpa A A 7424	4	4
" prunifolia fructucoccinea	4	4
" baccata oblonga A A	4	4
" prunifolia A A 139—2	12	8
" Sieboldii A A 1850	4	4
" baccata A A 2550	4	3
" " sanguinea A A	4	4
" " latekeeping variety	4	3
" " flava	4	4
" " variety A A	4	4
" " A A	4	3

CROSS-BRED APPLES.

The cross-bred apples commented upon on pages 368, 369 and 370 of last year's report made excellent progress during the past season. Many of the trees are now of a considerable size, and will blossom next year, when interesting results are anticipated. Out of a total of 117 trees which went into the winter of 1900-01, all came through in spring alive to tips, with the following exceptions :—

No. 1, Pyrus baccata x *Wealthy.*—Killed back slightly

No. 2, No 162.—Killed back one-quarter.

No. 3, No. 63.—Killed back one-half.

No. 4, Pyrus baccata x *Red Anis.*—Killed back slightly.

No. 5, Pyrus baccata x *Orange Crab.*—Killed back one-half.

The following additional cross-breds were received during the past season, a portion of which were used to complete the block already commenced, the balance being placed in a new orchard situated on the hillside, north of Superintendent's house. The appended notes show their progress during the summer.

Name.	Number Received.	Number Alive Fall 1901.	Name.	Number Received.	Number Alive Fall 1901.
Carleton	2	2	Hunter	4	4
No. 53	2	2	No. 19	1	1
No. 142	1	1	Pyrus baccata x Krimskoe	2	2
No. 198	1	Dead.	Pyrus baccata x Ball's Winter Crab	2	2
No. 192	2	1	Pyrus baccata x Pewaukee	2	2
No. 179	3	3	Seedlings of Progress	50	50
Eaton	3	3	" Novelty	48	46
No. 520	2	2	" Eaton	21	17
Cavan	1	1	" Dean	25	20
No. 165	2	2	" Eastman	31	27
No. 167	3	3	" Belmont	24	20
No. 184	2	2	" Pioneer	50	50
No. 183	2	1	" Olive	5	4
Belmont	4	4	" Cavan	8	8
No. 196	3	3	" Aurora	67	59
No. 175	4	4	" Charles	32	32
No. (lost)	1	1	" Prairie Gem	49	36
No. 163	1	1	" Pauline	12	12
Aurora	1	1	" Hunter	6	5
No. 132	1	1			
Eastman	2	2			
Parker	1	1			

The above table shows a very successful planting. Out of a total of 483 trees planted, most of them very small, 440 went alive into winter quarters, or not quite 9 per cent of a loss. We have now a large stock of these cross-breds on the farm, and in a few years some most interesting results in apple culture may be expected, as, up to the present, they have proven quite hardy.

GRAFTED APPLES.

The following varieties of apples were root-grafted on stocks of *Pyrus baccata* in the spring of 1899, and came through the winter of 1899-1900 in good condition. Excellent growth was made during the past season, and their further progress will be watched with interest :—

Ostrakoff, grafted on Pyrus baccata from Stevenson.
Wealthy " " " "
Apple 27 years old, grafted on Pyrus baccata from Stevenson.
Hibernal " " " "
Anisette " " " "
Repka Malenka " " " "
Anisim " " " "
Standard Apple " " " "
Crab Apple " " " "

PLUMS.

Although the plum crop was not a heavy one on the farm this season, it was in many respects very satisfactory. The trees were covered with blossom in the spring, and an exceptionally heavy crop of fruit set, the greater portion of which, however, was destroyed by the frost on the evening of June 6. Fortunately, not many of the trees were entirely stripped. In many instances, they were closely planted and sheltered each other, and enough fruit escaped the frost to enable us to obtain information in regard to the comparative merits of the various varieties. This partial immunity was particularly opportune by reason of the fact that a large block, containing some hundreds of seedlings, had come into bearing for the first time this season, thus enabling us to obtain an amount of data which might have otherwise been considerably delayed.

This large plantation of seedlings was sent from the Central Experimental Farm, in the spring of 1897, where they had been grown from the seed of fruit ripened at Ottawa. As mentioned in my report for 1897, they consisted of seedlings of Cheney, Hungarian, Yosemite Yellow, Voronesh, Ida, Rollingston, Weaver, De Soto, Van Buren, Wolf, Yosemite Purple, Speer and Americana.

Some of the plums described in the following pages were from a consignment sent from Ottawa in the spring of 1893. These were seedlings of Weaver, De Soto and Cheney, grown from plums which had ripened at the Central Experimental Farm. In the spring of 1897, some of the trees from this earlier consignment of seedlings blossomed for the first time, but owing to a late spring frost, the fruit did not form.

My report for 1898 shows that during that season 11 Weaver seedlings, 1 Cheney seedling and 2 De Soto seedlings fruited, but although frost came later than the average season, the fruit was frozen before fully ripe. Twenty of the same lot of seedlings bore fruit in 1899, when the same unfortunate experience occurred. In 1900 they again blossomed well and set fruit freely, but the crop was destroyed by a late spring frost.

The success this year has been most encouraging, but while hopeful for the future of the plum crop in Manitoba, especially from early ripening sorts, it must be borne in mind that there has been no frost in August this year, which is unusual.

The plums which have ripened on the Brandon Experimental Farm this year have been much superior, both in size and flavour, to the fruit produced on trees of the type *Prunus nigra,* which is the wild plum of Manitoba.

The varieties mentioned as Frankland's seedlings were procured from Mr. Thos. Frankland, of Stonewall, Manitoba.

If these plums continue to fruit well and prove hardy, it is intended to propagate the best of them for further distribution and test.

Following will be found comparative notes on the best varieties which ripened.

Weaver Seedling No. 1.—Ripe September 10 ; colour deep red ; depth 1½ inches ; nearly round ; thin skin ; flavour very good.

Weaver Seedling No. 4.—Ripe September 16 ; colour greenish yellow, splashed and dotted with red ; depth 1⅜ inches ; slightly elongated ; thin skin ; flavour very fine—one of the best.

Weaver Seedling No. 5.—Ripe September 20 ; colour deep yellow, dotted with red ; depth 1 inch ; round ; skin fairly thin ; flavour good.

Weaver Seedling No. 6.—Ripe September 16 ; colour deep red ; depth 1½ inches ; round ; fairly thin skin ; flavour good.

Cheney Seedling No. 8.—Ripe September 12 ; colour bright yellow, splashed with red ; depth 1¼ inches ; slightly elongated and flattened ; thin skin ; flavour fine.

Weaver Seedling No. 9.—Ripe September 10 ; colour bright yellow, splashed with red ; depth 1¼ inches ; slightly elongated and flattened ; thin skin ; flavour excellent.

Weaver Seedling No. 11.—Ripe September 12 ; colour bright yellow, splashed with red ; depth 1½ inches ; slightly elongated ; thick skin ; flavour good.

Weaver Seedling No. 12.—Similar to No. 11 in colour and shape, but of better flavour, and ripened four days later.

Wolf Seedling No. 13.—Ripe September 10 ; colour yellow, heavily splashed with red ; depth 1½ inches ; thin skin ; flavour good.

Weaver Seedling No. 14.—Ripe September 24 ; colour greenish yellow, dotted with red ; depth 1¼ inches ; thin skin ; flavour good ; roundish.

Weaver Seedling No. 16.—Ripe September 16 ; colour deep yellow, slightly splashed with red ; depth 1½ inches ; nearly round ; thin skin ; flavour very good.

Weaver Seedling No. 18.—Ripe September 15 ; colour deep yellow, nearly covered with red splashes ; slightly elongated ; depth 1⅝ inches ; thin skin ; flavour very fine—a first-class variety.

Weaver Seedling No. 20.—Ripe September 16 ; colour deep yellow, splashed with red ; depth 1½ inches ; slightly conical ; thin skin ; flavour very good.

Weaver Seedling No. 21.—Ripe September 18 ; colour deep yellow, slightly dotted with red ; depth 1⅝ inches ; slightly elongated ; thin skin ; flavour very fine—a first-class variety.

Voronesh Seedling No. 22.—Ripe September 10 ; colour yellow, heavily splashed with red ; roundish ; depth 1¼ inches ; skin fairly thin ; flavour very good.

Weaver Seedling No. 23.—Colour bright yellow, slightly splashed with red ; ripe September 13 ; elongated ; depth 1¼ inches ; thin skin ; flavour very good.

Native Seedling, No. 26.—Ripe August 21 ; colour red ; roundish oval ; depth 1 inch ; thin skin ; fine flavour.

Frankland's Seedling No. 27.—Ripe August 25 ; colour yellow, suffused with red ; roundish oval ; depth 1 inch ; thin skin ; flavour pleasant.

Frankland's Seedling, No. 29.—Ripe August 30 ; colour yellow splashed and dotted with deep red ; depth 1 inch ; elongated ; thick skin ; flavour good.

Cheney Seedling No. 30.—Ripe August 30, colour yellow, dotted with red ; depth 1¼ inches ; roundish ; thick skin ; flavour good.

Voronesh Seedling, No. 31.—Ripe September 12 ; colour yellow, splashed and dotted all over with red ; depth 1 inch ; round ; skin fairly thin ; flavour very good—a fine variety.

Yosemite Seedling No. 32.—Ripe September 20 ; colour bright yellow, splashed with bright red ; round ; depth 1 inch ; skin thin ; flavour good.

Voronesh Seedling, No. 35.—Ripe September 16 ; colour yellow, dotted with red ; round ; depth 1 inch ; thick skin ; flavour very good.

Hungarian Seedling, No. 36.—Ripe September 12 ; colour yellow, heavily splashed with red ; depth 1½ inches ; slightly flattened ; thin skin ; flavour very good.

Seedling No. 37.—Ripe September 9 ; colour deep yellow, heavily splashed with red ; nearly round ; depth 1½ inches ; thin skin ; flavour very good.

Seedling No. 39.—Ripe September 19 ; colour deep yellow, heavily splashed with red ; depth 1⅜ inches ; roundish and slightly elongated ; thin skin ; flavour good.

Seedling No. 43.—Ripe September 20 ; colour deep yellow, slightly dotted with red ; depth 1 inch ; round ; thin skin ; flavour good.

Seedling No. 47.—Ripe September 16 ; colour deep yellow, heavily splashed with red ; depth 1 inch ; round ; thick skin ; flavour good.

Seedling No. 48.—Ripe September 15 ; colour deep yellow, heavily splashed with red ; depth 1¼ inches ; elongated and flattened ; thin skin ; flavour good.

Seedling No. 49.—Ripe September 15 ; colour deep yellow, splashed with red ; depth 1 inch ; nearly round ; thick skin ; good flavour.

Seedling No. 52.—Ripe September 16 ; colour deep yellow, dotted with red ; depth $1\frac{3}{8}$ inches ; fairly thin skin ; flavour good.

Seedling No. 55.—Ripe September 16 ; colour deep yellow, slightly dotted with red ; thin skin ; flavour good ; nearly round.

Seedling No. 56.—Ripe September 16 ; depth $1\frac{1}{4}$ inches ; colour bright yellow, slightly dotted with red ; slightly flattened ; thick skin, flavour good.

Seedling No. 57.—Ripe September 16 ; depth 1 inch ; colour deep red ; conical ; thick skin ; flavour good.

Seedling No. 58.—Ripe September 17 ; colour bright yellow, slightly dotted with red ; depth 1 inch ; roundish ; thick skin ; flavour good.

Seedling No. 59.—Ripe September 15 ; colour bright yellow, heavily dotted with red ; depth $1\frac{1}{8}$ inches ; conical ; thin skin ; flavour good.

Seedling No. 60.—Ripe September 17 ; colour yellow, heavily splashed with red ; depth $1\frac{1}{8}$ inches ; thin skin ; flavour good.

Seedling No. 61.—Ripe September 15 ; colour yellow, heavily splashed with red; roundish; thin skin; flavour good.

Seedling No. 63.—Ripe September 16; colour deep yellow, nearly covered with red; depth $1\frac{3}{8}$ inches; conical; fairly thin skin; flavour very good.

Seedling No. 65.—Ripe September 15; colour deep red; depth $1\frac{1}{8}$ inches; conical; thick skin; flavour good.

Seedling No. 66.—Ripe September 18; colour deep yellow, heavily dotted with red; depth 1 inch; conical; thin skin; flavour good.

Seedling No. 67.—Ripe Septemper 17; colour deep yellow, heavily dotted with red ; conical ; depth 1 inch ; think skin ; flavour good.

Seedling No. 71.—Ripe September 20; colour greenish yellow, dotted with red; depth $1\frac{1}{2}$ inches; roundish; thin skin; flavour good—a fine variety.

Seedling No. 74.—Ripe September 28; colour deep red; depth 1 inch; round; thin skin; flavour good.

Seedling No. 75.—Ripe September 20; colour deep yellow, dotted with red; depth 1 inch; roundish; thin skin; flavour very good.

Seedling No. 76.—Ripe September 17 ; colour deep yellow, dotted with red ; depth $1\frac{1}{8}$ inch; roundish; thin skin; flavour very good.

Seedling No. 77.—Ripe September 20; colour bright yellow, dotted with red; depth $1\frac{1}{8}$ inches; slightly conical; thin skin; flavour good.

Seedling No. 80.—Ripe September 20 ; colour deep yellow, heavily splashed with red; depth $1\frac{1}{3}$ inches; flattened and elongated; thin skin; flavour good.

Seedling No. 81.—Ripe September 23; colour deep yellow, heavily splashed and spotted with red; depth $1\frac{1}{4}$ inches; conical; flattened; thin skin; flavour good.

Seedling No. 82.—Ripe September 23; colour yellow nearly covered with red ; depth $1\frac{1}{16}$ inch; thin skin; flavour good; conical.

Seedling No. 83.—Ripe September 18; colour yellow, heavily splashed and dotted with red; depth $1\frac{1}{4}$ inches; elongated; thin skin; flavour very good.

Seedling No. 84.—Ripe September 8; colour bright red; depth, $1\frac{1}{4}$ inches; elongated; flavour good; thin skin.

Seedling No. 86.—Ripe September 10; colour yellow, heavily splashed with red; depth $1\frac{1}{8}$ inches; elongated; thin skin; flavour very good.

Seven fair-sized trees of *Aiken* plum were received during the season from Mr. H. L. Patmore's nurseries, Brandon, and planted on the hillside. These are the only representatives growing on the farm of this variety, which has proven very satisfactory locally, and also at the Experimental Farm at Indian Head.

SAND CHERRIES.

There was a very fair crop of Sand Cherries harvested during the past season, which would have been exceptionally heavy had not the frost of June 6th seriously injured them.

Brandon, No. 6.—Ripe August 4 ; medium size ; dark red in colour, slightly astringent ; very prolific ; thin skin ; firm flesh ; fairly sweet.

Seven trees of 'Rupert' Cherry and one tree of 'Compass' Cherry, crosses between the Sand cherry and plum, were received from the Central Experimental Farm during the past season. All made excellent growth, which ripened well and went into winter quarters in good condition.

RASPBERRIES.

Owing to the unfavourable season of 1900, very little growth was made in raspberries, consequently the crop of 1901 was extremely light. The past year's growth, however, has been very vigorous and gives promise of a satisfactory crop next season. On the approach of winter, the canes were laid down and the tips covered with soil, in order to afford as much protection as possible.

CHERRIES.

A small quantity of seed of three varieties of cherries were received from Russia in the fall of 1900.

These were stratified for the winter and sown on April 25, 1901. The germination was good and a number of plants of each variety made excellent growth, and have gone into winter quarters in fine condition.

CURRANTS.

The currant crop of 1901 was only a very medium one. Although there was a good display of bloom, the setting was considerably interfered with by spring frosts, and only a comparatively small crop of fruit was harvested. Exceptionally fine growth, however, was made during the season, and hopes are entertained of better results in 1902.

Following will be found a few notes on the different varieties under cultivation here, which have fruited during the past season.

RED VARIETIES.

Red Grape.—A robust grower ; flavour fairly sweet ; size medium to large ; length of spike, 1¾ inches ; ripens evenly.

Raby Castle.—A robust grower ; fairly sweet ; size medium to large ; length of spike, 1⅞ inches ; ripens evenly.

Pomona.—A fairly vigorous grower ; size medium to large ; length of spike, 2 inches ; flavour sweet ; an even ripener.

Wilder.—Produced only a very few berries ; trees small.

North Star.—A robust grower ; size small to medium ; flavour fairly sweet ; length of spike, 2 inches ; even ripener.

Red Cherry.—Of weak growth ; a large berry ; sub-acid ; length of spike, 1¾ inches ; not productive.

Versailles.—A fairly vigorous grower ; size small to medium ; length of spike, 1½ inches ; not fruitful ; very sweet.

Fay's Prolific.—Produced very little fruit ; plant weak ; flavour insipid ; berries very large.

Prince Albert.—A vigorous grower ; fruit small ; sweet ; length of spike, 1¼ inches ; not fruitful.

Victoria.—A vigorous grower ; fruit medium ; slightly acid ; length of spike, 1⅞ inches ; ripens evenly ; fairly productive.

Fertile D'Angers.—This variety has spikes of medium length ; size large ; sweet ; a fairly vigorous grower.

WHITE VARIETIES.

White Grape.—Flavour good ; sweet ; length of spike, 1¾ inches ; berry small to medium ; a vigorous grower, but gave a poor crop.

White Dutch.—Vigorous grower ; fruit small to medium ; flavour very pleasant ; spike of medium length, somewhat thinly set.

BLACK VARIETIES.

Black Champion.—Killed to near ground, winter 1900-1901. Made fair growth 1901.

Lee's Prolific.—A robust grower ; thinly set ; flavour poor, sub-acid ; skin tough.

Victoria.—Plants weak and produced practically nothing.

Black Naples.—Plants in weak condition, and produced very little fruit.

Standard.—A vigorous grower ; skin thin ; flesh sweet and juicy ; berries large.

Monarch.—A vigorous grower ; berries of medium size ; skin thin ; spikes very thinly set ; flesh sweet and juicy.

Eclipse.—Skin rather tough, sub-acid ; medium sized berries thinly set ; a fairly vigorous grower.

Charmer.—Berry of medium size ; skin tough ; flavour fair, somewhat acid ; a vigorous grower ; thinly set.

Stewart.—Size medium to large ; skin tough ; of fair flavour, acid ; a vigorous grower ; thinly set.

Perry.—Berry small to medium ; skin tough ; of fair flavour, somewhat acid ; a vigorous grower ; thinly set.

Kerry.—Skin rather tough ; of fair flavour, acid ; a vigorous grower ; not very productive ; spikes thinly set.

Winona.—Berry of medium size ; skin thin ; flesh juicy and sweet ; a vigorous grower ; thinly set.

Clipper.—Berry small to medium ; skin fairly tender ; flesh slightly acid ; a vigorous grower ; fruit thinly set.

Beauty.—Berry medium to large ; thin skin ; flesh sweet and juicy ; fairly well set ; a vigorous grower.

Ontario.—Berry small to medium ; skin moderately thin ; flesh fairly sweet and juicy ; fairly well set ; a vigorous grower.

Eagle.—Berry medium to large ; skin thin ; flesh sweet and juicy ; a very vigorous grower ; thinly set.

RHUBARB.

There are now nineteen varieties of this useful vegetable growing at the Experimental Farm, most of them showing distinct characteristics in colour, habit of growth, yield, &c.

Owing to the comparatively trifling production of fruit in Manitoba and the high prices charged for the imported product, rhubarb occupies a prominent position in the Manitoba housekeeper's supply of preserves. Fortunately, rhubarb seems to be specially adapted to the Manitoba climate, and with even a moderate amount of cultivation will respond freely.

It is always desirable, if possible, to plant in considerable quantity, so that some of the roots may be available for spring forcing. These should be lifted just before freezing up, placed in barrels in the cellar and covered with sand. Water should then be given from time to time as required, and in a short time tender and juicy shoots will be produced, which, coming in mid-winter, are a very desirable addition to the table. The forced roots should be planted outside the following spring, and allowed one year to recuperate before pulling. The following descriptive notes were taken during the growing season, and to secure the weights an average plant of each variety was stripped on June 27.

Early Scarlet.—A fairly vigorous grower ; colour bright cherry red throughout ; deeply ribbed on under side of stalk ; very tender and juicy ; average length of stalk, 18 inches ; weight from one plant, 13 pounds.

Early Prince.—A fairly vigorous grower ; colour green, heavily mottled with light red ; slightly ribbed on under side ; very tender and juicy ; average length of stalk, 22 inches ; weight from one plant, 24 pounds.

Sangster's Prince of Wales.—A very vigorous grower ; colour brilliant red throughout, no green ; stalk slightly indented on upper side and ribbed on under side ; very tender and juicy ; average length of stalk is 22 inches ; weight from one plant, 20 pounds. A very fine variety.

Tobolsk.—A vigorous grower ; colour a mottled red ; slightly ribbed on under side ; deeper colour than No. 2 ; very tender ; upper side nearly flat ; average length of stalk, 22 inches ; weight from one plant, 25 pounds.

Paragon.—A fairly vigorous grower, of a mottled deep red colour ; ribs on under side well defined, and deep indentation on upper side ; only fairly tender ; average length of stalk, 16 inches ; weight from one plant, 10½ pounds.

Prince Albert.—A vigorous grower ; heavily mottled with deep red ; slightly ribbed on under side ; nearly flat on upper side ; very tender and juicy ; average length of stalk, 24 inches ; weight from one plant, 31½ pounds.

Magnum Bonum.—A vigorous grower ; of a light red mottled colour ; slightly ribbed on under side ; nearly flat on upper ; similar in appearance to No. 6, though not so deep in colour ; very tender and juicy ; average length of stalk, 20 inches ; weight from one plant, 27 pounds.

Brabant's Colossal.—A very vigorous grower ; of a light red mottled colour ; nearly smooth on under side ; upper side nearly flat ; tender and juicy ; average length of stalk, 26 inches ; weight from one plant, 30 pounds.

Early Crimson.—An extremely vigorous grower ; lower half stalk mottled with light red, upper half greenish ; heavily ribbed on under side, upper side indented ; tender ; average length of stalk, 26 inches ; average weight from one plant, 30½ pounds.

Scarlet Nonpareil.—A very vigorous grower ; colour mottled with red ; moderately ribbed on under side ; well marked indentations on the upper side ; tender and juicy ; average length of stalk, 26 inches ; average weight from one plant, 26 pounds.

General Taylor.—A moderate and very even grower, with very little variation in size of stalk ; colour green throughout, sparsely mottled with very deep red ; tender and juicy ; heavily ribbed on under side, indented on upper ; average length of stalk, 14 inches ; average weight of one plant, 16½ pounds.

Marshall's Royal Linnæus.—A vigorous grower ; colour mottled with light red ; slightly ribbed on under side, nearly flat on upper side ; very tender ; average length of stalk, 16 inches ; average weight of one plant, 26 pounds.

Giant.—A vigorous grower ; colour heavily mottled with light red ; under side ribbed ; upper side nearly flat ; very tender and juicy ; average length of stalk, 18 inches ; average weight from one plant, 19 pounds.

Excelsior.—Planted fall of 1900 ; not yet advanced enough to report on.

Royal Albert.—A somewhat weak grower ; stalks numerous but thin ; colour at base very bright red, shading to green, mottled with red. Only very slightly ribbed on upper side, tender. Average length of stalk, 14 inches. Average weight from one plant, 22½ pounds.

Queen.—Planted fall 1900, and not sufficiently advanced to report on.

Strawberry.—A very vigorous grower ; colour mottled with light red ; slightly ribbed on under side, nearly flat on upper side. Average length of stalk, 20 inches. Average weight from one plant, 31½ pounds.

Tottle's Improved.—An extremely vigorous grower ; individual stalks very large ; deeply indented on upper side and distinctly ribbed on lower ; somewhat stringy ; colour greenish ; slightly mottled with light red. Average length of stalk, 20 inches ; average weight from one plant, 31½ pounds.

Victoria.—A vigorous grower ; colour lower half deep red, shading to a mottled red towards leaf. Indented on upper side and distinctly ribbed on lower ; tender and juicy. Average length of stalk, 14 inches ; average weight from one plant 17 pounds.

ARBORETUM.

No additions were made to the Arboretum during the past season. A portion of the hillside to the north consisting of a poor gravelly ridge was planted with green ash, which made fair growth, nearly all the trees planted surviving. As the larger part of the Arboretum is now covered with grass, it is rendered more attractive, and the large collection of varieties included is much appreciated by visitors. The growth in some portions has been so luxuriant that a considerable number of trees have had to be removed to make room for the more meritorious varieties which were being crowded. A gratifying feature in connection with this is that many varieties which were classed as tender a few years ago, are now proving much hardier on account of the shelter they enjoy.

ADDITIONS TO ARBORETUM IN 1900.

The following notes on trees added to the Arboretum during 1900 show their condition after one winter's trial.

Scotch Yellow Rose.—Wintered well ; strong growth, 1901.

Populus nigra.—Wintered well ; strong growth, 1901.

Juniperus sabina erecta.—Wintered well ; strong growth, 1901.

Picea excelsa.—Wintered well ; strong growth, 1901.

Lonicera tatarica grandiflora.—Wintered well, strong growth, 1901.

Amber Currant.—Wintered well ; strong growth, 1901.

Rosa acicularis.—Wintered well ; strong growth, 1901.

Carpinus caroliniana.—Wintered well ; strong growth, 1901.

Fraxinus nigra.—Killed back one-half ; weak growth, 1901.

Japanese Oak.—Killed back one-half ; weak growth, 1901.

Rosa alpina.—Wintered well ; strong growth, 1901.

Rhus aromatica.—Killed back three-quarters ; strong growth, 1901.

Thuya occidentalis Elwangeriana.—Wintered well ; strong growth, 1901.

Ribes aureum tenuifolium.—Wintered well ; strong growth, 1901.

Rhamnus davurica.—Killed back one-quarter ; strong growth, 1901.

Rosa cinnamonea sibirica.—Wintered well ; strong growth, 1901.

Thuya occidentalis variegata.—Wintered well ; fair growth, 1901.

Rhamnus catharticus.—Killed back one-half ; strong growth, 1901.

Spiraea sorbifolia.—Killed back one-quarter ; strong growth, 1901.

Ribes alpinum sterile.—Wintered well ; strong growth, 1901.

Betula alba fastigiata.—Wintered well ; fair growth, 1901.

Gymnocladus canadensis.—Wintered well ; strong growth, 1901.

Photinia variabilis.—Dead ; winter killed.

Cotoneaster acutifolia.—Wintered well ; strong growth, 1901.

Berberis vulgaris foliis purpureis.—Killed back one-half ; fair growth, 1901.

Acer Saccharinum, No. 1, from Minnesota Seed.—Killed back one quarter ; fair growth, 1901.

Acer saccharinum, No. 2, from Minnesota Seed.—Killed back one-quarter ; fair growth, 1901.

Cytisus nigricans.—Killed back one half ; strong growth and flowered, 1901.

Celastrus articulatus.—Killed back three-quarters ; weak growth, 1901.

Rhus glabra.—Dead ; winter killed.

Salix candida femina.—Wintered well ; strong growth, 1901.

FLOWERING SHRUBS.

There are now a very large number of flowering shrubs growing on the Experimental Farm, many of which are very beautiful, and they elicit much admiration from visitors who are fortunate enough to visit the farm during their flowering period. The following were specially noted during the past season :—

Syringa vulgaris (*Common Lilac*).—Commenced to flower on May 19. These were exceptionally fine during the past season, as many as two hundred spikes being counted on some bushes. This is one of our most desirable shrubs, and is quite hardy.

Crataegus coccinea.—This beautiful hawthorn, though a native shrub, is well worthy of extensive cultivation. It commenced to flower on May 17, and continued until the end of the month, during which time it was a dazzling mass of white.

Viburnum lantana (*Wayfaring tree*).—Commenced to flower on May 21. Its pretty white trusses, borne in profusion, make it desirable in a collection of flowering shrubs. Thoroughly hardy.

Lonicera tatarica (*Tartarian Honeysuckle*).—This beautiful honeysuckle is one of our most desirable flowering shrubs. It commenced to bloom on May 22, and continued in flower for nearly a month, being literally covered with blossoms during that period. It is quite hardy, and succeeds in almost any location.

Caragana Redouski (*Siberian Pea*).—This variety of caragana is much more floriferous than *Caragana arborescens*, and of a dwarf habit. It is a mass of yellow when in full bloom, and is quite a resort for bees. Commenced to flower on May 18. Thoroughly hardy.

Prunus pumila (*Sand Cherry*).—A very early blooming and strong growing shrub; commencing to bloom early in May, it furnishes a mass of white flowers which are very acceptable at that season. It is quite hardy.

Caragana frutescens pendula.—This is one of the most beautiful of the caraganas; its charming pendulous habit, coupled with its free blooming propensities, makes it a most desirable acquisition to a collection of ornamental shrubs. It commenced to flower May 18. Quite hardy.

Spiraea hypericifolia.—A dwarf flowering shrub of compact habit, producing large masses of pure white flowers, early in the season. Hardy.

Syringa vulgaris, Charles X.—This is the best variety of Lilac as yet grown at the Farm; the spikes are very large and full, of a much deeper colour than *Syringa vulgaris*, and it is very free flowering.

Pyrus Americana (Mountain Ash).—The western form of this species is quite hardy here, and its large trusses of white flowers in late spring, followed by its brilliant red berries in autumn, combine to make it one of our most beautiful flowering shrubs.

Viburnum opulus sterilis (Snowball).—This is the sterile form of the High Bush Cranberry (Viburnum opulus). Its large ball-like trusses of beautiful white flowers, which are borne very abundantly, make it a most desirable ornamental shrub; quite hardy.

Cytisus purpureus.—This began to flower May 22. A dwarf and very floriferous species. The pea-shaped flowers are of a bright purple colour and are borne in profusion.

Genista tinctoria (Greenweed).—A very free flowering dwarf ornamental shrub. Its yellow pea-shaped flowers literally cover the plant and present a dazzling mass of colour; hardy.

Pyrus malus.—Though not thoroughly hardy, this shrub will produce flowers here and is well worthy of a trial. The blossoms are of a fair size and of a bright brick red colour, making a very attractive specimen.

HEDGES.

The large hedges consisting of Native Spruce (*Picea alba*), Native Maple (*Acer negundo*), Siberian Pea Tree (*Caragana arborescens*), Native Ash (*Fraxinus pennsylvanica lanceolata*), made excellent growth during the season. No additions were made to our sample hedges, a number of which suffered considerably from the effects of the snowstorm, previously referred to, as did also the large Caragana hedge, planted in 1893. By careful pruning, however, nearly all traces of the damage have been obliterated and no permanent injury is anticipated.

Following will be found some notes on these hedges, taken during the season:—

Pyrus baccata aurantiaca (Berried Crab of Siberia).—A promising hedge, but somewhat thin.

Lonicera tatarica elegans (Bush Honeysuckle).—A very promising medium sized hedge.

Caragana mollis glabra.—Promising but not so compact as *Caragana arborescens.*

Artemisia abrotanum (English Southernwood).—A very symmetrical dwarf hedge.

Shepherdia argentea (Buffalo Berry).—An ornamental dwarf hedge.

Rosa rugosa.—A low growing hedge, ornamental when in flower but suckers badly.

Celtis occidentalis (Hackberry).—Does not promise to be a desirable hedge; not thoroughly hardy and rather sensitive to spring frosts.

Ligustrum amurense (Amur Privet).—Not thoroughly hardy, but a very symmetrical dwarf hedge.

Spiraea Douglasii (Douglas's Spirea).—Rather unpromising as a hedge, not thoroughly hardy.

Syringa Josikea (Hungarian Lilac).—Very symmetrical and ornamental.

Crataegus Coccinea (Native Hawthorn).—A very slow growing and somewhat thin hedge.

Lonicera albertii (Albert's Honeysuckle).—An ornamental hedge, but needs trellising to keep it in shape.

Fraxinus pennyslvanica lanceolata (*Native Green Ash*).—Not a promising hedge ; thin and rather susceptible to spring frosts.

Prunus Americana (*Native Plum*).—Promising ; a fairly compact hedge.

Acer ginnala (*Asiatic Maple*).—A most ornamental dwarf hedge ; very compact.

Rhamnus frangula (*Breaking Buckthorn*).—Makes a compact hedge.

Caragana grandiflora (*Large Flowering Pea Tree*).—A good medium hedge ; badly bent down by snowstorm.

Salix Britzensis (*Willow*).—A promising looking hedge.

Thuya occidentalis (*Western Arbor-vitæ*).—Makes a small and slow growing hedge.

Artemisia Abrotanum tobolskianum (*Rusian Southernwood*).—Not a desirable hedge.

Populus deltoidea (*Cottonwood*).—This free growing hedge has died from a severe attack of the yellow poplar rust which causes the leaves to wither and drop.

Larix pendula (*American Larch*).—Gives promise of making a good deciduous hedge.

Salix Laurifolia (*Laurel-leaved Willow*).—One-half killed out.

Salix Voronesh (*Voronesh Willow*).—Not healthy, killed back somewhat.

Rosa rubrifolia (*Red-leaved Rose*).—Killed back one-half ; not a desirable shrub here for hedge purposes.

Cotoneaster vulgaris (*Common Cotoneaster*).—Apparently of rather too spreading a habit to make a satisfactory hedge.

Lonicerea Tatarica elegans (*Elegant Tartarian Honeysuckle*).—Symmetrical and ornamental.

Salix laurifolia (*true*) *True Laurel-leaved Willow*).—Not healthy.

Ribes aureum (*Yellow Flowering Currant*).—A very pretty hedge.

Neillia opulifolia aurea (*Golden-leaved Ninebark*).—A very ornamental dwarf hedge.

Neillia opulifolia (*Ninebark*).—Very handsome and compact.

Populus tremuloides (*Tremulous Poplar or Aspen*).—A somewhat thin hedge.

Prunus pennsylvanica (*Native Pin Cherry*).—A symmetrical and compact hedge.

Corylus americana (*Native Hazel Nut*).—Not a promising hedge.

Amelanchier alnifolia (*Native Saskatoon*).—Ornamental but thin.

Rosa Sayi (*Native Wild Rose*).—An ornamental hedge, but its propensity to sucker makes its value questionable.

Spiraea salicifolia (*Native Meadow Sweet*).—A fine dwarf ornamental hedge,

Symphoricarpus occidentalis (*Native Snow-Berry*).—A very symmetrical hedge, but was badly bent down by snowstorm.

Elæagnus argentea (*Wolf Willow*).—Ornamental but somewhat thin.

Cornus stolonifera (*Native Dogwood*).—A compact and symmetrical hedge.

Syringa vulgaris (*Common Lilac*).—A good ornamental hedge.

AVENUES.

On account of the storm previously referred to, a vigorous pruning was necessitated on the Maple Avenue (*Acer negundo*) during the summer, and at the close of the season very few traces of damage were discernible.

The avenue composed of Native spruce (*Picea alba*) alternated with Native Maple, is a very attractive feature on the Farm. Many of the Spruce trees are now twenty feet high, and a considerable amount of seed was gathered from them during the autumn.

SHRUBS AND TREES RECEIVED DURING 1901.

A considerable number of trees representing one hundred and fourteen varieties were received from the Central Experimental Farm during the past year, and were planted in one of the Hedge Plots. Some of these, including some received from France, succumbed shortly after being planted, being in an advanced condition on arrival. All the varieties were, however, represented in the fall, and as many interesting species are included, it is hoped that they will winter successfully.

Perhaps one of the most interesting portions of the consignment was a collection of twenty distinct varieties of Lilac, which will be a most welcome addition to our stock of this very popular flowering shrub.

THE VEGETABLE GARDEN.

The past season was in most respects a decidedly favourable one for vegetables. The soil was in good condition for germination in the spring, and with the exception of a few weeks of dry weather immediately succeeding this, the season was all that could be desired. Nearly all varieties tested were up to and even above the average, and notwithstanding a sharp frost on the evening of June 6, very little material damage was noticeable. The results were very satisfactory.

ONIONS.

The onion crop was one of the most satisfactory recorded at the farm for some years. Nine varieties were sown on April 10, with Planet Junior hand drill, in rows eighteen inches apart. The seed germinated readily, the growth was vigorous all through the season, and all varieties ripened well. The yield was above the average. There was a very small percentage of 'thick necks,' and no traces of disease were manifest. The 'sets' were quite satisfactory with the exception of 'English Multipliers,' which were not as vigorous as usual. In the following table they are arranged in the order of their productiveness :—

Variety.	Date Sown.	Date Ripe.	Colour.	Shape.	Per cent of Thick Necks.	Average Weight of Bulbs.	Yield per Acre.	
						Ozs.	Bush.	Lbs.
Yellow Globe Danvers	April 10	Sept. 3	Light yellow	Globular	0	6	556	36
Trebon's Yellow	" 10	" 7	"	"	0	5	538	27
White Spanish Straw Coloured	" 10	" 12	Dark yellow	Flattish	15	5½	459	48
Blood Red	" 10	" 6	Dark red	"	0	6	453	45
White Dutch Hard Round	" 10	" 6	White	"	9	4¾	423	30
Red Wethersfield	" 10	" 6	Dark red	"	3	7½	423	30
Market Favorite Keeping	" 10	" 6	Dark yellow	Flat	5	5	405	21
Paris Silver Skin	" 10	" 3	White	"	2	4½	363	..
James' Keeping	" 10	" 3	Dark yellow	Globular	4	4	326	42
ONION SETS.								
Shallots	April 10	July 25	Brown	Clusters	0	1	170	40
English Multipliers	" 10	" 20	Dark yellow	"	0	2½	195	33
Yellow Dutch Sets	" 10	" 30	Light yellow	Globular	0	8	586	34

LETTUCE.

Nineteen varieties of lettuce were sown on April 10, with Planet Junior hand drill, in rows sixteen inches apart. On account of the moist condition of the soil, the germination was prompt, and all the varieties were well represented. For some time

after germination there was a period of dry, hot weather, which materially affected their progress, and which may account for the fact that a considerable percentage went to seed before forming heads. All varieties ripened seed, which was collected for future use.

The results of the test are given below in the order of their productiveness :—

Name of Variety.	Date Sown.	Date Headed out.	Variety.	Colour.	Average Weight.	Flavour and Texture.	Commenced to Seed.
					Oz.		
White Paris Cos...	April 10	July 8	Cos..........	Light green...	18	Fine flavor, firm heart	July 20
Trianon...........	" 10	" 8	"	Dark green....	16	" ..	" 18
Neapolitan........	" 10	" 5	Curled cabbage	"	17	" ..	" 14
Blond Stonehead..	" 10	" 1	" ..	Light yellow..	16	" ..	" 10
Early Ohio........	" 10	" 1	" ..	" ..	14	" ..	" 20
Marvel or Red Besson.............	" 10	" 10	" ..	Red edged, dk. yellow......	12	Bitter soft heart	" 18
Trocadero Red-edged..............	" 10	" 5	" ..	Light green, red edged...	10	Fair flavor, firm heart	" 12
All Year Round, black seeded.....	" 10	" 5	Smooth cab'ge	Dark yellow ..	10	Sweet, fairly firm head	" 12
White Marvel of Cazard..........	" 10	" 7	Curled cabbage	Light yellow..	10	Bitter, fairly firm head	" 15
Brown Stone Head.	" 10	" 3	" ..	Light yellow, red edged...	9	Soft head, slightly bitter.	
All Year Round, white seeded.....	" 10	" 5	Smooth cab'ge	Light yellow..	8	Sweet flavour, firm heart......	" 10
Wheeler's Tom Thumb..........	" 10	" 1	Curled cabbage	Dark green...	5	" ..	" 10

The following varieties included in this list went to seed before heading out :— White Tennis Ball, Hardy Red Winter, Red Edged Victoria, Algiers, Hammersmith, Green Paris Cos, Forcing Milly.

CABBAGE.

Nine varieties of cabbage were sown in cold frame on April 26, and thinned to three inches apart as soon as they could be handled. They were planted outside on June 6, and as the weather at that period was particularly favourable, nearly all the plants survived.

In the following table they are arranged in the order of their earliness :—

Variety.	Date Sown.	Date Set Out.	Per Cent Headed.	Shape.	Average Weight.	Texture.
					Lbs.	
Paris Market Very Early................	April 25..	June 6..	98	Conical...	7	Firm.
Extra Early Express...	" 25..	" 6..	97	" ...	6	Somewhat loose.
Flat Parisian.......	" 25..	" 6..	100	Flat..	13	Very firm.
Winningstadt..........................	" 25..	" 6..	97	Pointed ..	8	"
St. John's Day—Early Drumhead... ...	" 25..	" 6..	94	Flat.. ..	8	Firm.
Savoy Green Globe..................	" 25..	" 6..	98	Roundish.	7½	Somewhat loose.
Red Polish Short Stem.................	" 25..	" 6..	87	" .	6	Firm.
Red Large Drumhead	" 25..	" 6..	94	Flat..	8	"
Brussels Sprouts......	" 25..	" 6..	......	Did not mature sprouts.		

CAULIFLOWER.

Seven varieties of cauliflower were sown on April 25 in cold frames, and all germinated well. Transplanting commenced on June 6, and the weather being specially favourable, nearly all the plants survived, as in the case of the cabbage. A noticeable peculiarity of this vegetable during the past season was its late maturing, this being the case generally throughout the province, the late varieties not heading out before frost, and even the earlier ones being much later than usual.

Following will be found the results arranged in tabular form in order of earliness :—

Variety.	Date Sown.	Date Set Out.	Per Cent Headed.	Colour.	Texture.	Average Weight.
						Lbs.
Early Snowball	April 25..	June 6..	84	White...	Firm and close..	6
Extra Early Paris..	" 25..	" 6..	85	Yellow. ..	Somewhat open.	4½
Extra Early Selected Dwarf Erfurt	" 25..	" 6..	75	White....	Close	7¼
Early Paris Nonpareil	" 25..	" 6..	78	"	"	6
Large Algiers	" 25..	" 6..	None.			
Chambourcy Mammoth	" 25..	" 6..	"			

PEASE.

Only three varieties of garden pease were tested during the past season. These were sown outside on May 7, in double rows (three feet apart between the double rows). The germination was very poor, and only a small quantity of plants resulted. On examination being made of the small quantity of seed left over from sowing, the fact became apparent that a large proportion of the peas were affected by Pea Weevil. As this is becoming somewhat common of late years, it would seem to point out the advisability of using Manitoba home-grown seed, which is usually a bright, clean sample.

Variety.	Date Sown.	Date Ready.	Length of Pod.	Number of Pease.	Length of Vine.	Flavour.
			Ins.		Ins.	
American Wonder	May 7..	July 6..	2½	5— 6	10	Very sweet.
Nott's Excelsior.	" 7..	" 7..	2¾	5— 6	9	"
Heroine	" 7..	" 20..	4 1/16	9—10	28	Very fine.

RADISH.

Eleven varieties of radish were sown on May 7, with Planet Junior hand drill, in rows twelve inches apart. The germination of varieties was good, and as we were favored with moist weather during the period of root formation, the flavour and texture was far above the average. All were good, with the exception of Very Early Yellow Turnip and Early White Turnip, which were both somewhat deficient in flavour.

Variety.	Date Sown.	Colour.	Shape.	Flavour.
Forcing Turnip, Extra Early Dwarf	May 7	Red	Turnip	Very good.
Forcing Turnip, Scarlet	" 7	"	"	Fair.
Early Scarlet	" 7	"	Round	Very good.
Early Dwarf Scarlet. Olive shaped	" 7	"	Olive	Excellent.
Forcing Scarlet White Tip Turnip	" 7	Red, white t'pd	Turnip	Very good.
Olive-shaped Scarlet	" 7	Red	Olive	Fair.
White Short Leaf Forcing, Olive-shaped	" 7	White	"	Very good.
Scarlet White Tipped Turnip	" 7	Red	Round	"
Early White Small Turnip	" 7	White	"	Fair.
French Breakfast	" 7	Red	Half long	"
Very Early Yellow Turnip	" 7	L. yellow	Turnip	Poor.

CUCUMBERS.

Cucumbers were again an excellent crop. Although the frost on the evening of June 6 completely destroyed the first sowing, the second sowing on June 7 made such rapid progress that they were very little behind average years in point of maturity. Four varieties were sown in the open, in hills 5 feet apart each way, and the germination was good in all instances.

The results are given in order of earliness :—

Variety.	Date Sown.	Date Ready.	Length.	Diameter.	Productiveness.	Average Weight.	Colour.	Shape.
			In.	In.		Oz.		
Early Cluster	June 7	Aug. 12	7	$2\frac{1}{2}$	Very productive	10	White	Straight.
Paris Pickling	" 7	" 12	9	$2\frac{1}{4}$	"	7	Green	Twisted.
White Wonder	" 7	" 12	7	$2\frac{1}{2}$	"	10	White	Straight.
Evergreen White Spine	" 7	" 12	8	3	"	8	Green	"

PUMPKINS.

Two varieties of pumpkins were sown in the open on May 21, in hills 10 feet apart, This sowing was destroyed on June 6 by frost, and resown on June 7. A good crop was harvested from the late sowing.

Variety.	Date Sown.	Date Ready.	Colour of Skin.	Colour of Flesh.	Average Weight.	Productiveness.	Flavour.
					Lbs.		
Connecticut Field	June 7	Aug. 20	Yellow	Yellow	20	Very productive	Fair.
Japanese Pie	" 7	" 25	"	"	13	Fairly "	Excellent.

SQUASH.

Three varieties of squash were sown the past season on May 21, in the open, in hills ten feet apart. The first sowing was destroyed by frost on the evening of June 6, and was resown on June 7. The late sowing produced a very satisfactory crop, in all respects, and two varieties ripened.

Variety.	Date Sown.	Date Ready.	Colour of Flesh.	Colour of Skin.	Average Weight.	Ripened.
					Lbs.	
Long White Bush Marrow..	June 7..	Aug. 14..	White....	White....	10	Seed ripened.
English Vegetable Marrow..	" 7...	" 14..	"	"	8	"
Hubbard..	" 7...	" 14..	Yellow....	D. green..	12	Green.

The White Bush Marrow seems to be the most desirable variety for Manitoba.

CARROTS.

Four varieties of carrots were sown on May 7, with Planet Junior hand drill, in rows eighteen inches apart. The crop was by far the most satisfactory of any recorded here for years, the roots being remarkably smooth and of good size. The long varieties again proved their inferiority, the yield being small, and necessitating much labour in pulling.

Variety.	Shape.	Colour.	Flavour and Texture.	Date Lifted.	Average Weight.	Yield per acre.	
					Lbs.	Bush.	Lbs.
Luc Half Long, Scarlet...	Half long.......	Red......	Very good	Sept. 28	1¼	671	51
Parisian Forcing, Red	S. stump rooted.	"	" .	" 28	9	484	..
French Horn	" .	1. red.....	Fair......	" 28	1½	443	40
Long Blood Red	Very long.......	"	Good.....	" 28	8	265	

BEETS.

Five varieties of beets were sown with Planet Junior hand drill, in rows thirty inches apart, on May 17. The germination was good in all cases, the product being well up to the average in quality. The long varieties were (as usual) superior in colour and texture.

Variety.	Date Sown.	Date Ripe.	Colour.	Average Weight.	Flavour and Texture.	Shape.	Yield per Acre.	
				Lbs.			Bush.	Lbs.
Long Smooth Deep Blood Red.	May 17.	Sept. 28	Deep red narrow rings.	6½	Very fine.	Very long.	773	23
Early Blood Red Turnip.	" 17.	" 28	Wider rings, considerable white	4¼	Fair......	Turnip....	655	36
Black Queen.........	" 17.	" 28	Deep red wide rings...	2½	Very fine.	Long.	382	48
Egyptian............	" 17.	" 28	Wide rings, very white	1½	Coarse....	Flat......	268	24
Deli's Black Leaf....	" 17.	" 28	Deep red narrow rings.	6½	Very fine.	Very long.	110	..

SWEET HERBS.

Three varieties of sweet herbs were sown on May 7, with Planet Junior hand drill, in rows eighteen inches apart, sage, savory and thyme, the latter failed, however, to germinate, a common occurrence with this herb. The others grew with their usual luxuriance.

SALSIFY.

This vegetable was as usual below the average ; the roots being very small and rough.

BEANS.

Six varieties of French beans were sown outside on May 21, in rows thirty inches apart, viz.: Fame of Vitry, Emperor of Russia, Dwarf Extra Early Edible Podded, Bagneolet Dwarf Black Speckled, Canadian Wonder, Flageolet Scarlet wax. All germinated well but were completely destroyed by the frost on the evening of June 6, 1901. A resowing was made on June 7, but owing to all the seed having been used for the first sowing, a substitution of varieties had to be made, procured from a local seedsman.

Variety.	Date sown.	Date ready.	Colour.	Length of pod.	No. of Beans.	Flavour and texture.	Productiveness.
Golden Wax	June 11	Aug. 17	Yellow.	6	3—4	Very tender.	V. productive.
Early China	" 11	" 18	"	5	3—4	"	Fairly "
Flageolet Scarlet Wax	" 11	" 20	"	6	4—5	"	Very "
Mammoth Red German Wax	" 11	" 30	"	7	4—5	"	" "

TURNIPS.

Garden turnips were a much more satisfactory crop this season than for several years past. Their quality for table use being better than usual, doubtless on account of the moist season. Three varieties were sown with Planet Junior hand drill, on May 21, in rows thirty inches apart, and the following results were obtained :—

Variety.	Date sown.	Date ready.	Colour.	Shape.	Flavour
Early White Strap Leaved American Stone	May 21	July 15	White	Long	Good
Early Stone or Stubble Green Top	" 21	" 17	"	Round	"
Half Long Early White Vertus	" 21	" 20	"	Half long	Fair

TOMATOES.

The comparatively open fall of the past season was very favourable to tomatoes, and a moderate quantity of ripe fruit was harvested. Two varieties were sown in hot-bed on April 25 and transferred to the open on June 14, nearly all the plants surviving. Dwarf Champion produced the first ripe fruit, but before frost Earliest of All proved the most productive.

Variety.	Date sown.	Date ripe.	Ripe fruit.	Green fruit.	Total.	Shape.	Flavour.
			Lbs.	Lbs.	Lbs.		
Earliest of All	April 25	Aug. 30	25	17	42	Somewhat ribbed.	Good.
Dwarf Champion	" 25	" 24	18	12	30	Smooth	Very good.

INDIAN CORN.

Three varieties of Indian corn were sown on May 21, in hills three feet apart by two feet, with Planet Junior hill dropping drill. Through severely cut by the frost on June 6, the majority of the plants survived, though the check made them somewhat late. None of the varieties ripened seed.

Variety.	Date sown.	Date ready.	Length of cob.	Variety.	Weight per dozen.	Flavour.
					Lbs.	
Cory	May 21	Aug. 15	7	10-rowed dent	4¾	Excellent.
Mitchell's Extra Early	" 21	" 20	8	8-rowed flint	4	Fair.
First of All	" 21	" 20	6¾	10-rowed flint	4½	Excellent.

ASPARAGUS.

The asparagus crop was particularly satisfactory during the past season. Commencing to shoot on May 6, it continued uninterruptedly for two months, its luxurious shoots being produced in profusion. All varieties did well—Barr's Mammoth being somewhat the largest yielder. Four varieties were grown, namely : Conovor's Colossal, Columbus Mammoth White, Barr's Mammoth and Giant Argenteuil.

CITRONS.

This vegetable, which is in much demand in Manitoba for preserving, gave an enormous yield during the past year. One variety was sown, viz. : Preserving, and from one row, 96 feet long, 473 pounds were gathered. Taking into consideration the fact that the first sowing was frozen out on June 6, the yield was a remarkable one.

PARSNIPS.

The parsnip crop was decidedly above the average this season, only one variety 'Hollow Crown,' was sown, with Planet Junior hand drill, in rows thirty inches apart, on April 10. The crop was harvested on October 12, and was of excellent quality, the yield being 755⅓ bushels per acre, calculated from the product of two rows, each 66 feet long.

SPINACH.

One variety, namely, 'Long Standing,' was sown on April 10, in rows eighteen inches apart. The product was of fine flavour and remained in condition for table for a comparatively long period. This vegetable comes in very opportunely in the early part of the season, when vegetables are somewhat scarce.

PARSLEY.

One variety, 'Extra Curl,' was sown on April 10, and gave, as usual, an excellent crop. A number of complaints are received here annually with reference to its non-success generally, but in nearly every instance late sowing was the cause of the trouble. To obtain the best results with parsley the sowing should be done as early as possible in the spring.

THE FLOWER GARDEN.

The flower garden was very satisfactory, and a continuous mass of bloom throughout the season. The weather during the early spring months, was favourable for hot-bed work, and a very fine stock of bedding plants were ready for transplanting to the open at the end of May. The first sowing was made on April 2, and concluded on the 25th, transplanting being brought to a conclusion on May 10. Bedding out commenced on June 3, and was well under way, when we were visited by the cool wave on June 5 and 6, previously referred to, and which caused much damage in this department. Many of the newly bedded annual flowers were frozen, and necessitated a replanting, which fortunately we were able to accomplish by reason of having surplus stock reserved for contingencies. Zinnias and Dahlias were the most seriously injured, and were cut to the ground, while all varieties were more or less affected. On the return of fine weather, however, many of the plants recovered, and very soon all trace of the damage was obliterated ; and the long open fall compensated in a great measure for the check sustained at this period. The Herbaceous perennials were much admired, and the number of varieties of this class now growing here constitute a very comprehensive collection.

Variety.	How Sown.	Date Sown.	Date Transplanted.	Flowering Period.
Asters (10 types)	Boxes, hotbed.	April 8..	June 3 to June 15.	July 5 to frost.
Amarantus superbus	" "	" 8..	" " ..	Ornamental leaved.
" bicolor	" "	" 8..	" " ..	" "
Ageratum Mexicanum	" "	" 8..	" " ..	July 3 to frost.
Antirrhinum majus	" "	" 8..	" " ..	June 30 to severe frost
" " nanum	" "	" 8..	" " ..	" "
Abronia umbellata	Outside	May 25..	Not	July 1 to frost.
Brachycome iberidifolia	Boxes, hotbed.	April 17..	June 3 to June 15.	June 25 to frost.
Cosmos hybrida	" "	" 8..	" " ..	Did not flower.
Celosia (3 varieties)	" "	" 10..	" " ..	July 10 to frost
Chrysanthemum coronarium	" "	" 10..	" " ..	" 1 "
" frutescens	" "	" 10..	" " ..	" 10 "
" carinatum hybridum Burridgeanum	" "	" 10..	" " ..	" 3 "
Dahlias, single	" "	" 8..	" " ..	" 10 "
Gaillardia picta	" "	" 15..	" " ..	June 25 to frost.
" Lorenziana	" "	" 15..	" " ..	" 25 "
Godetia nana	Outside	May 25..	Not	" 20 "
Helichrysum bracteatum	Boxes, hotbed.	April 10..	June 3 to June 15.	July 15. Everlasting.
Nicotiana affinis	" "	" 10 .	" " ..	June 20 to frost.
Nigella damascena	" "	" 12..	" " ..	" 15 to July 5.
Portulaca double	Outside.	May 25..	Not	" 25 to frost.
Phlox Drummondii	Boxes, hotbed.	April 8..	June 3 to June 15.	" 10 to severe frost.
Petunias, single mixed	" "	" 30..	" " ..	July 3 "
" double "	" "	" 30..	" " ..	" 3 to frost.
Salpiglossis variabilis	" "	" 15..	" " ..	" 1 "
Stocks, double German 10 weeks	" "	" 17..	" " ..	" 5 "
" " large flowering	" "	" 17..	" " ..	" 5 "
Scabiosa major	" "	" 10.	" " ..	June 20 "
" minor	" "	" 10..	" " ..	" 20 "
Verbena hybrida auriculæflora	" "	" 17..	" " ..	July 10 to severe frost.
Zinnia elegans	" "	" 25..	" " ..	" 10 to frost.

The delay in the sowing of Petunias was due to the late arrival of seed, but as pains were taken to push the plants along, very little time was lost, and the results were particularly fine. The double flowers included the finest we have ever grown here, being very large, compact and beautifully fringed. Special attention is called to the Scabiosa (Sweet Scabious), an annual not generally cultivated here, but which is worthy of more attention. It is very hardy, and its varied coloured flowers of rich

texture render it quite conspicuous. It also has a very delicate fragrance. In Asters two types, Queen of the Earliest and Queen of the Market, are deserving of special mention. Both of these are very early and desirable. Another point to which we would draw attention is the desirability of growing the single dahlias from seed and treating them as annuals. They are exceptionally easy of propagation and very vigorous growers, and if sown early in April, will be covered with flowers about the middle of July of brilliant colouring and rich texture, their long stems rendering them invaluable for cutting.

Annuals sown outside.—As many people do not care to go to the trouble of making a hot-bed, a test was made during the past season to ascertain what varieties of annuals could be successfully grown by sowing them in the open. The result is given below, and shows clearly that a very pretty garden may be had without the necessity of a hot-bed. The seed was sown on April 25, in well prepared beds, in rows varying from twelve to twenty-four inches apart, according to the expected growth of the variety, and thinned out to six inches apart in the row as soon as the seedlings could be handled. Care should be exercised in regard to the distance apart of the rows, in order to avoid overcrowding when the maximum growth has been obtained.

Name of Variety.	Remarks.
Asters Truffauts Pæony Perfection	Flowered well ; made good show.
" Queen of the Earliest	" for long season.
" " Market	" "
" Imbricated Pompon	" well ; made good show.
" Single Large Flowering	" "
" Pyramidal Bouquet	" "
" Perfection	" "
" Lilliput	" "
" Dwarf Multicolor	" "
Amarantus Superbus	Ornamental leaved ; made fine plants.
Ageratum Mexicanum	Flowered well.
Abronia umbellata	"
Brachycome iberidifolia	" early and well and made fine show.
Calendula officinalis	" early and exceptionally well.
Cosmos Hybrida	Did not flower.
Celosia pyramidalis nana	Flowered well.
Chrysanthemum Coronarium	" early and well.
" frutescens	" well.
" carinatum Burridgeanum	" early and well.
Godetia nana	" exceptionally well and made fine show.
Helichrysum bracteatum	" somewhat late.
Nigella damascena	" exceptionally well and made very fine show.
Pansy (Bedding mixture)	" well.
Portulaca Double Large Flowering	" exceptionally well and made very fine show.
Phlox drummondii grandiflora	" " "
Salpiglossis variabilis	" " "
Gaillardia picta	" " "
" " Lorenziana	" " "
Nicotiana affinis	" well.

SWEET PEAS.

A collection of named varieties were sown the past spring with excellent results. All flowered well. The following varieties were considered the most striking :—

Othello.—A very large flower, deep crimson in colour.

Prince Edward of York.—Carmine scarlet, with crimson wings.

Aurora.—Striped rosy orange on white ; a most attractive variety.

Lottie Hutchins.—Pencilled pink on a straw yellow.

Salopian.—Rich deep crimson red, very large and of fine form.

Sadie Burpee.—The best of the white varieties.

Hon. F. Bouverie.—Salmon, with creamy pink wings.

Lady Nina Balfour.—A beautiful silvery lavender.

Admiration.—Pinkish heliotrope, wings a shade lighter.

HERBACEOUS PERENNIALS.

This class of plants continue to attract special attention, on account of their hardiness and ease of cultivation. The former situation of the perennial bed having been found undesirable, a new location has been selected, to which the old plants have been removed, and in which new varieties are being planted as fast as procured. The following varieties were received during the spring of 1900, and the appended notes show their condition after having passed through one winter. Most of them flowered nicely in their season :—

Asclepias tuberosa.
Aster, W. Bowman.
" White Queen.
Achillea Millefolium rubrum.
" Sibirica White.
" Ptarmica Fl. Pl.
Amthemis tinctoria kelwayi.
Artemisia Stellariana.
Anemone Narcissiflora.
Ajuga reptans atropurpurea.
" genevensis.
Boltona latisquama.
" Asteroides.
Campanula altaica.
Chelone barbata.
Centaurea montana alba.
" macrocephala.
Coreopsis verticillata.
" Delphinifolia.
Erigeron macranthus.
Funkia lancifolia.
Geranium maculatum.
" Wilfordi.
" Sanguineum.
" platypetalum.
Helenium Grande striatum.
Helianthus maximiliana.
" gigantea.
Hemerocallis disticha Fl. Pl.
" fulva.
" variegata.
" Kwanso Fl. Pl.
" graminæfolia.
" dumortieri.
Iris variegata arquinto.
" " Pancrace.
" " Minos.
" " Innocenza.
" " Coquette.
" " Darius.
" " Souvenir.
" " Henry Havard.
" "
" squalens.
" " Jacquesiana.
" " Lady Seymour.
" " La Tristesse..
Iris squalens, Tarquin.
" " Minerva.
" " Hector.
" " Haydee.
" " Dina.
" " Bronze Stoffel.
" " La Marmora.
" " Cerberus.
" amoena Julia Grise.
" " Maria Theresa.
" " Crebillon.
" " Victor Lemoine.
" " Mrs. H. Darwin.
" plicata.
" " Severtii.
" " Lord Seymour.
" " Gisela.
" neglecta Sapho.
" " Arlequin Milanais.
" " Agathe.
" " Hericartiana.
" pallida.
" " Chamœleon.
" sibirica.
" " violacea.
" " alba.
" " hæmatophila.
" germanica.
" " Verschuur,
" pumila.
" " lutea.
" " Cinerea.
" " gracilis.
" Florentina.
" ensata.
" " Biglumis.
" " oxypetala.
" cristata.
" nudicaulis.
" furcata.
" Goldenstadtiana coerulescens.
" giganteus.
" flavescens.
" virescens.
" aurea.
" Balkana.
" Chamæiris.
Iris biflora.
" blondovi.
" ruthenica.
" Cengialti.
" orientalis.
" Hungarica.
" prismatica.
Lysymachia clethroides.
Physostegia Virginiana alba.
Pyrethrum uliginosum.
Phalaris arundinacea fol var.
Phlomis fruticosa.
Papaver orientale.
Phlox decussata pantheon.
" " tourbillon.
" " dwarf white.
" carolina ovata.
" amœna.
" divaricata.
" subulata lilacina.
" reptans.
" pilosa.
Poterium officinale.
Rudbeckia laciniata.
Spirea venusta pallida.
" kamschatka.
" filipendula.
" " fl. pl.
" palmata.
" ulmaria.
" digitata glabra.
" ulmaria fl. pl.
" pubescens.
Symphytum asperrimum.
Sidalcea candida.
Sempervivum montanum.
Solidago rigida.
" Missouriensis.
" gigantea.
Thermopsis caroliniana.
Tradescantia virginiana alba.
" " cœrulea.
Valeriana officinalis.
Veronica virginica.
" elegans carnea.
" spicata.

BULBS PLANTED 1901.

A consignment of bulbs were received from the Central Experimental Farm this autumn and were planted in the perennial block. They consist of : Tulips, in varieties; Crocus, Scilla's, Iris Hispanica, Snowdrops, and Frittilaries.

A covering of manure was placed on the bed, and the results will be reported on the next season. A consignment of Hyacinths, Narcissus and Lilium candidum were potted and will be flowered in the Superintendent's house during the winter. A supply of different sorts of Lilies were also received from Ottawa.

DISTRIBUTION OF GRAIN, POTATOES, ETC.

A larger distribution than usual was made of potatoes, maple seed, rhubarb, flower and brome grass seed.

The following quantities were sent out to applicants :—

Grain of all kinds in 3-pound bags	555
Seedling trees, packages	310
Shrubs, packages	113

Distribution of Potatoes, &c.

Potatoes in 3-pound bags	334
Maple seed in 1-pound bags	471
Rhubarb seed, packages	217
Flower seed, packages	201
Brome grass seed, in 1-pound packages	270

Box Elder or Manitoba Maple Seeds.

The following reports have been received from parties to whom Manitoba Maple seeds were sent in 1-pound packages, during the spring of 1900 :—

Number of applicants supplied	240
Number of reports received	89

	Success.	Failures.
Seeds sown on summer fallow	3	12
" Spring ploughing	20	6
" Fall ploughing	22	11
" Breaking	9	3
" Garden (dug with spade)	3	..

Largest number of plants raised from 1-pound packet, 2,000.
Maximum height of seedlings at end of season, 2½ feet.

Reports of Distribution of Collections of Trees, Spring 1900.

Only eight per cent of parties supplied with trees reported on them. These all report having received the packages in good condition.

Number of applicants supplied	525
Number of reports received	43

Average per cent of cuttings struck :

	Per cent.
Russian Poplars	20
Cottonwoods	34
Willows	13

Maximum growth, summer 1900 :

	Feet.
Russian Poplar	4
Cottonwood	3
Willows	3

PROPAGATION OF TREES FOR DISTRIBUTION.

Caraganas, Russian Poplars, Elms, and Willows, were grown for free distribution. The Caraganas were propagated from seed. The seed was sown the same as garden peas, in rows thirty inches apart, about one inch deep and about one inch apart in the rows. Fresh gathered Elm seed was sown in shallow drills 12 inches apart and covered with fine soil by means of a garden rake.

PROPAGATION OF TREES FOR THE FORESTRY BRANCH OF THE DEPARTMENT OF THE INTERIOR.

Under your instructions some ten acres of land was set apart for the growing of trees for the above department.

The principal part of these were Native Ash-leaved Maples, grown from seed, but a number of Elms and Willows were also grown.

The Maple seed was sown in drills three feet apart, the seeds touching each other in the row. Most of the seed was soaked before sowing. In some instances the seed was ploughed under, by striking out a furrow three inches deep and placing the seed at the bottom of the furrow, and ploughing a second furrow over it. Adjoining rows were struck out with a Planet Junior drill two inches deep, and the seed sown by hand and the soil filled in with a rake. The rows covered with the plough produced 160 trees to the chain of row, and the rows filled in with rake 733 trees to the chain. Either the ploughing was too deep, or else the soil when thrown in with a plough was too hard and lumpy for the best results. Altogether 110,000 maples and elms were grown from seed, and in addition seedling elms were collected from the natural bluffs by the river side.

SAMPLES FOR EXHIBITION PURPOSES.

Five cases of samples were sent to the Glasgow Exhibition during the past year. These were exhibited along with samples from the other Experimental Farms, and received very favourable notices.

Last fall an additional exhibit was prepared from the crop of 1901, and forwarded to Glasgow; although not as extensive as the first exhibit, it gave a very fair idea of the character of the past year's crop.

On completion of the Dominion Government building on the Brandon fair grounds this year, a very complete exhibit was prepared and installed therein, and the display was greatly augmented by a tasty exhibit from the Central Experimental Farm at Ottawa.

A small collection of samples was sent to the Dominion Government agency in Texas.

A somewhat extensive display of Horticultural products was made at the Brandon Horticultural Exhibition.

NEW BREAKING.

About three acres of pasture field which had been in Western Rye Grass for eight years was broken up in the spring, thoroughly disc-harrowed, and at once re-sown with Brome Grass seed in the proportion of fifteen pounds of seed per acre. A good

catch was obtained and furnished abundance of pasture from early August until winter set in. Two acres of original prairie in the same field was also broken up, backset and harrowed. This will be sown to brome seed early next spring. It is not found necessary to keep the cattle out of a field when sowing a portion of it with brome grass. No doubt it would be advisable to do so for the first few months if the land were at all wet; otherwise there would be danger of tramping out the young grass plants.

VISITORS.

The number of visitors to the Experimental Farm during this year approximated ten thousand.

A noticeable feature was the large number of delegates from the Western and South-western States. These were representative farmers sent to examine and report on the Canadian North-west as a desirable location for the surplus population of their respective States. They appeared greatly impressed by the crops of grain and grasses growing on the Experimental Farm.

Two railway excursions were run to the farm during the year, one along the main line of the Canadian Pacific Railway from Rosser west, and the other from the south-western branches of the Canadian Pacific Railway. Each excursion carried about six hundred, nearly all being farmers and their families.

The provincial ploughing match and farmers' picnic were also held on the farm, and largely attended. The ploughing matches are already exerting an influence for good in the province, and the ploughing done has greatly improved in late years.

FARMERS' MEETINGS.

A number of farmers' meetings were attended during the past year, and the turn-out of farmers was much above the average, the attendance in some instances reaching four hundred.

Meetings were attended at the following places :—

Winnipeg	Jan.	18	Cartwright	Feb.	7
Brandon	"	19	Winnipeg	"	20
Carman	"	29	"	"	21
Miami	"	30	"	"	22
Nelson	"	31	MacGregor	Mar.	16
Morden	Feb.	1	Winnipeg	April	16
Manitou	"	4	Rapid City	May	25
Pilot Mound	"	5	Brandon	July	24
Crystal City	"	6	Winnipeg	"	31

METEOROLOGICAL TABLES.

Month.	Highest Temperature		Lowest Temperature		Total Rainfall.	Total Snowfall.	Total Amount of Sunshine.
1900.	on	°	on	°	Inches.	Inches.	Hours.
December	21	39·4	31	−28·6	....	12	86·3
1901.							
January	13	38 2	2	−41·6	....	17	99·1
February	13	25 5	2	−25	....	....	126·9
March	29	41 2	5	−18·5	....	....	166·4
April	30	85	18	13	....	....	170·8
May	28	92	13	28	1·12	....	330·3
June	1	85·5	7	26·5	7·72	....	182·5
July	19	92·5	1	44	1·93	....	243·6
August	16	92	30	40·1	1·13	....	286·1
September	2	91·2	18	22	3·34	....	127·5
October	24	78·9	27	21	63	....	183·8
November	1	53	22	1	11	3	109
Totals	....	....	....	....	15·98	32	2,112·3

CORRESPONDENCE.

This year 4,804 letters were received and 3,210 despatched, irrespective of 2,755 circulars sent out.

I have the honour to be, sir,

Your obedient servant,

S. A. BEDFORD,

Superintendent.

EXPERIMENTAL FARM FOR THE NORTH-WEST TERRITORIES.

REPORT OF ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T,
November 30, 1901.

DR. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa, Ont.

SIR,—I have the honour to submit herewith the fourteenth annual report of the operations on the Experimental Farm for the North-west Territories, at Indian Head, Assiniboia, during the year 1901.

The past season has been one of the most successful ever experienced, not only on the Experimental Farm, but throughout the whole country. Bright prospects from beginning to end of the growing season consummated in the most abundant crop ever reaped in any country, and although unsettled weather for a time caused some fears for the safety of the reaped grain, the conditions became more favourable when the real North-west fall opened, and in proportion to the total amount of grain saved in good condition the loss is very slight.

Last winter was mild with few or no storms. Snow fell in the middle of November, and in some districts remained on the ground until April ; while in others it disappeared in March.

On account of the wet condition of the land when it froze up in the fall of 1900, and the frequent rain and snow storms during April, seeding was late in starting, but from the beginning to the end of May, while seeding was in progress, the weather and soil conditions were all that could be desired.

June opened hot and dry, and some apprehension was felt for the young grain plants, but a rain which was general throughout the Territories on the 12th, followed by warm and frequently heavy showers continuing to the end of July, caused a remarkable growth of cereals in every part of the Territories. In previous years some districts have been more favoured than others in this respect, but this year all have fared alike.

Harvest commenced from the 15th to the 20th of August, and was completed early in September. No frost was reported till the 17th, by which time all grain, except some late oats, was in stook.

There were no heavy winds during the season, and no injury was sustained by the grain at any time.

Shortly after stacking and threshing had commenced, in Assiniboia at least, heavy falls of rain and snow took place and caused delay in securing the grain, as well as more or less loss in badly stacked and stooked grain. The unfavourable weather, with occasional bright days, continued to October 13, when a radical change took place, and from that time to the present not a day has been lost.

Many very heavy yields of grain are reported from almost every part of the Territories. In Assiniboia, where wheat is the principal crop, yields of 50 to 55 bushels per acre have been threshed from fields of 100 acres or over, in the Indian Head, Wide-awake and Abernethy districts ; while many farmers have secured 40 to 45 bushels per acre, in some cases on four to six hundred acres.

In the Regina, Pense, Moosejaw and Sintaluta districts equally heavy crops have been harvested. One family of father and six sons in the Pense district are reported to have between seventy-five and eighty thousand bushels of wheat to market.

Settlers with ten, fifteen or twenty thousand bushels are numerous in the districts mentioned, and no doubt the same may be said of the more easterly portion of Assiniboia, although I have no direct information in the matter.

The newly settled districts along the Soo line of railway have been equally fortunate, and a large influx of settlers is expected in the districts north of Weyburn, Milestone and Yellow Grass as soon as spring opens next year.

Saskatchewan reports a good crop of wheat and oats, and Alberta has the heaviest crop of oats it has ever secured. .

The oat crop throughout the Territories is a heavy one. The majority of farmers in the wheat-growing sections have paid little attention to this important cereal, being content to sow on stubble land with little or no cultivation and thresh from 30 to 50 bushels per acre ; whereas, some, and the number is increasing, are using fallowed land and securing 75 to 100 bushels. In several instances the yield has been over 100 bushels per acre this year.

Fallowed land, the past season, as in every other year, has given the highest yield of wheat per acre, and so far as can be ascertained, the crop grown thereon has sustained no injury from rust, smut or other cause. In some cases the quantity of straw was excessive and lodged in places, but this apparently has had no appreciable effect on the yield.

Grain sowed on stubble land ploughed or cultivated in the fall of 1900 or just before seeding, invariably gave good returns ; while on similar land without cultivation the yield was comparatively light.

Cattle throughout the Territories have not done as well during the past season as in 1900. Flies and soft grass are no doubt accountable for this to a considerable extent. The heavy rains in June and July made the grass soft and watery and caused a most abundant crop of mosquitoes and flies. The price of export steers has kept up, but the demand for stockers has not been so brisk as in former years.

EXPERIMENTAL FARM CROPS.

The crops on the Experimental Farm the past season were, without an exception, the best since the commencement of operations in 1887. Everything grown yielded above the average and many varieties of grain were above any previous record. The sample too, surpasses that of any other year.

Pasture, hay, corn, potatoes, vegetables and roots (with the exception of field carrots, which although above ordinary years, were not in keeping with the other crops), were a most gratifying success.

All the tests made with grain, roots, fodder-plants, &c., came through the season without a single set-back from winds, frost or other causes, and all have been safely secured and threshed in good condition.

Small fruits were a fair crop, and crab-apples and plums produced abundantly.

Trees and shrubs of all kinds made a strong, healthy growth.

EXPERIMENTS WITH SPRING WHEAT.

Seventy-one varieties were tested on 1-20th or 1-40th acre plots ; eight of the same varieties on plots ranging from ⅜ acre to 10 acres. Red Fife was used in the test of fertilizers ; rotation test ; test of sowing selected, well-cleaned and small seed, and in the test of blue stone as a preventive of smut.

TEST OF VARIETIES IN UNIFORM PLOTS.

Seventy-one varieties, of which fifty had been previously tested and twenty-one were new sorts, were sown on May 7 by hoe-drill, at the rate of one and one-half bushels per acre.

The field chosen for this test of wheat, as well as for the uniform plots of oats and barley, was one of twenty acres entirely surrounded by wind-breaks of trees, and is of a uniform quality of soil—a clay loam. Wheat seeding was later than it otherwise would have been on account of wet spots in the field.

The land had been well fallowed in 1900, having received one deep ploughing in May, and several surface cultivations during the growing season. No weeds were allowed to grow and after the grain appeared above ground, the plots were gone over several times and anything injurious to the crop was removed.

All the varieties germinated evenly and well, and made a strong, healthy growth, without sustaining the least injury from smut, rust, frost or any cause whatsoever. A few days before being cut, rust appeared on the leaves of some of the varieties but the grain was not affected.

WHEAT—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Mason	Aug. 19..	104	47	Weak ..	5	Bald ...	5,000	67	..	63½	Slightly.
Australian No. 13	" 24..	109	50	Strong .	4	" ...	5,240	66	40	60½	
Huron	" 23..	108	48	" ..	4	" ...	5,440	66	40	62½	"
Countess	" 18..	103	54	" ..	4	" "..	5,980	65	20	59½	
Goose	" 29..	114	50	Medium	2½	Bearded	4,380	63	..	65	
Rideau	" 22..	107	44	" ..	3¾	Bald ...	4,980	62	40	62	"
Rio Grande	" 29..	114	53	Strong .	4½	Bearded	6,620	62	..	59	"
Stanley	" 20..	105	52	" ..	4	Bald ...	5,960	61	40	62½	
Essex	" 24..	109	55	" ..	4½	" ...	4,800	61	20	60	
Dawn	" 20..	105	47	" ..	3	" ...	3,650	61	..	64	
Clyde	" 17..	102	56	" ..	4¼	" ...	5,360	60	40	62½	
Beaudry	" 25..	110	53	Weak ..	3½	Bearded	4,910	60	40	64	"
Minnesota No. 181	" 25..	110	53	Strong .	4	Bald ...	5,880	60	..	62	
Vernon	" 26..	111	46	Medium	3	Bearded	6,280	59	20	63	"
Minnesota No. 149	" 24..	109	51	" ..	4	Bald ...	6,320	59	20	57½	
Dion's	" 23..	108	55	Strong .	5	Bearded	6,180	59	20	61	"
Australian No. 23	" 23..	108	52	" ..	4¼	Bald ...	6,180	58	40	61½	
Beauty	" 20..	105	54	" ..	5	" ...	6,480	58	40	59	"
Speltz	" 17..	102	46	Weak ..	2	" ...	2,275	58	20	46½	
Colorado	" 28..	113	49	" ..	3½	Bearded	3,750	58	20	63	"
Dufferin	" 26..	111	54	Medium	4¼	" ...	4,700	58	..	62	
Minnesota No. 163	" 24..	109	52	Strong .	4	Bald ...	6,420	58	..	62½	
Australian No. 27	" 21..	106	53	" ..	4¼	" ...	7,000	58	..	60	
Weldon	" 17..	102	53	" ..	4¼	" ...	6,880	57	40	62	"
Wellman's Fife	" 24..	109	59	" ..	4¾	" ...	5,040	57	40	61¾	
Monarch	" 25..	110	52	Medium	5	" ...	6,600	57	40	58	
Roumanian	" 27..	112	52	" ..	3¼	Bearded	3,820	57	20	65¼	
Minnesota No. 169	" 26..	111	53	" ..	4	Bald ...	5,200	57	20	60½	
Red Fern	" 28..	113	55	" ..	5	Bearded	3,980	57	20	63	
Herisson Bearded	" 28..	113	46	Weak ..	2½	" ..	3,660	57	20	63½	"
Percy	" 18..	103	54	Strong .	4	Bald ...	4,160	57	20	61½	
Preston	" 29..	114	47	" ..	3	Bearded	4,880	57	20	63½	
Hastings	" 24..	109	49	Medium	3½	Bald ...	3,360	57	20	63½	
Red Fife	" 25..	110	52	Strong .	3½	" ...	5,220	57	..	61½	
Advance	" 25..	110	52	" ..	4	Bearded	5,370	57	..	62¾	
Hungarian	" 26..	111	49	Weak ..	3	" .	3,520	56	40	64¾	
Japanese	" 23..	108	52	Strong .	3½	" ..	4,520	56	40	60½	
Australian No. 19	" 23..	108	48	Medium	3½	Bald ..	6,280	56	40	60½	
Pringle's Champlain	" 26..	111	50	" ..	5	Bearded	7,120	56	40	62½	"
Admiral	" 23..	108	53	Strong .	4	" ..	5,980	56	20	62½	"
Campbell's White Chaff	" 23..	108	54	Weak ..	3½	Bald ...	4,560	56	..	62½	"
Ladoga	" 22..	107	50	Strong .	3½	Bearded	3,280	55	40	62½	

WHEAT—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
White Connell	Aug. 24..	109	55	Strong .	4	Bald ...	3,420	55	20	62	
Blair	" 19..	104	49	Weak ..	3½	" ...	4,300	55	..	62½	Slightly.
Crawford	" 14..	99	49	Medium	3	" ...	5,160	55	..	62½	
White Russian	" 20..	105	57	Strong .	4¾	" ...	5,580	54	..	61½	
Progress	" 20..	105	52	" ..	4	" ...	3,560	54	..	62½	
Laurel	" 26..	111	51	Weak ..	5½	" ...	5,120	54	..	57½	
Cassel	" 23..	108	47	Strong .	3½	" ...	3,200	54	..	63	
Australian No. 25	" 22..	107	52	" ..	4¼	" ...	4,900	54	..	59½	
Blenheim	" 26..	111	53	" ..	4¼	Bearded	5,175	54	..	62	
Alpha	" 25..	110	50	" ..	3½	" ...	5,650	53	40	62	
Fraser	" 15..	100	51	Medium	3	" ...	3,780	52	..	62	
Bishop	" 21..	106	51	Strong .	4½	Bald ...	4,480	52	..	62½	
White Fife	" 19..	104	55	" ..	5	" ...	5,720	52	..	61½	
Plumper	" 22..	107	48	Medium	3¼	Bearded	4,540	51	..	63½	
Chester	" 23..	108	43	" ..	3¾	Bald ...	4,440	50	40	61	
Australian No. 9	" 22.	107	50	Strong .	4	" ...	5,080	50	40	59	
Captor	" 23..	108	54	" ..	4¾	" ...	5,780	50	20	62½	
Ebert	" 14..	99	46	Medium	3½	" ...	5,220	50	20	64	
Crown	" 24..	109	54	" ..	4¼	" ...	3,590	50	..	62¾	
Benton	" 23..	108	50	Strong .	4	" ...	4,160	49	20	63	
Robin's Rust-proof	" 27..	112	44	Weak ..	3¾	" ...	4,800	49	20	64½	Badly.
Red Swedish	" 29..	114	48	" ..	4	Bearded	4,080	49	..	63½	Slightly.
Early Riga	" 13..	98	48	Medium	3½	Bald ...	4,100	49	..	63½	
Australian No. 10	" 23..	108	47	Strong .	3¼	" ...	6,100	48	40	63	
Harold	" 15..	100	43	Medium	2½	Bearded	4,160	48	..	64	
Angus	" 25..	110	45	Strong .	3½	Bald ...	2,840	46	..	62	
Norval	" 19..	104	52	" ..	3¾	Bearded	3,880	45	40	61	
Cartier	" 21..	106	44	" ..	4	" ...	4,040	44	40	63	
Byron	" 18..	103	46	" ..	3½	" ...	4,200	43	40	61¾	

NOTE.—Where the foregoing are noted as 'slightly rusted' it applies to the leaves, as the straw was not in any way affected.

TEST OF VARIETIES IN FIELDS.

Eight varieties of wheat were sown on plots of three-fifths to ten acres of land worked in various ways as shown in the accompanying table.

The fallow land was ploughed seven inches deep in May, 1900, and cultivated four times during the season.

The Brome backsetting was Brome sod broken two inches deep in June ; backset four inches deep in August, and cut up with disc-harrows after harvest. A few of the grass-roots sprouted in the spring, but unless closely looked for could not be noticed in the crop.

The stubble land had been ploughed seven inches deep in the fall and well harrowed.

The prairie sod was part of a fifteen year old pasture field, broken and backset in the usual way.

The crop was very heavy in all cases, but with the exception of Preston on fallow, no grain lodged or was in any way injured. Preston was struck by rust a few days before being ripe, but as only the leaves were affected, the yield was not reduced.

The yield of all varieties was very satisfactory ; and the sample is an excellent one

Name of Variety.	Character of Soil.	Size of Plot.	Date of Ripening.	Number of Days maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Proportion Rusted.
		Acres			Inches		Inches		Bush.	Lbs.	
Preston........	Fallow	5	Aug. 26	114	53	Medium	4	Bearded	54	54	A little rust on leaves.
White Russian..	"	½	" 26	114	55	Strong..	4½	Bald ...	49	40	
Red Fife	"	3⅕	" 25	113	53	" ..	4	"	49	..	"
"	Backsetting (native sod).	1½	" 27	117	56	Medium	4	"	48	..	
"	" (brome sod).	1	" 23	108	54	Strong..	4	" ...	45	50	
Preston.........	" "	4	" 16	104	57	" ..	4¾	Bearded	45	45	
Red Fern.......	" "	1⅔	" 20	109	58	" ..	5	" ..	45	..	
Huron..........	Fallow	⅗	" 22	110	58	Medium	4	" ..	45	..	"
Stanley	Backsetting (brome sod).	4	" 16	102	57	Strong..	4½	Bald ...	40	45	
Wellman's Fife..	" "	4½	" 23	113	58	" ..	4½	"	39	20	
Red Fife	Stubble, fall ploughed..	1	" 24	114	57	" ..	4	"	36	20	
Percy	" " ..	6	" 20	109	55	" ..	4¼	"	36	18	

TEST OF BLUESTONE AS A PREVENTIVE OF SMUT IN WHEAT.

Sown on May 7, on 1-40th acre plots of fallowed land, by hoe-drill, at the rate of 1½ bushels per acre.

Seed.	Condition.	Treatment.	On 25 sq. feet.	
			Good heads.	Smutty heads.
Red Fife ...	Clean	1 lb. bluestone to 10 bush. wheat, dipped 1 minute.	943	11
" ...	"	" " " 1 hour...	949	..
" ...	Smutty . ..	" " " 5 minutes	873	8
" ...	"	Untreated	519	431

WHEAT—TEST OF SOWING SELECTED, WELL-CLEANED AND SMALL SEED.

In this test the selected seed used was hand-picked when ripe and before being cut in 1900, and thoroughly cleaned by mill ; the well-cleaned seed was our best Red Fife, run twice through the fanning-mill and was a large, plump sample. The small seed was what was taken out of the well-cleaned grain.

The seed was sown on 1-20th acre plots of fallowed land, by hoe-drill, at the rate of 1½ bushels per acre, on May 7.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Red Fife, well-cleaned......	Aug. 28..	113	51	Strong....	3½	Bald.	5,100	67	..	61½
" selected..........	" 28..	110	51	"	3½	"	5,520	59	40	63
" small seed........	" 28..	114	52	"	3½	"	4,700	59	40	62

TEST OF FERTILIZERS.

Six plots of 1-40th acre each were sown with Red Fife Wheat ; five of which were treated with artificial manures, and the sixth used as a check-plot.

While the grain was growing no difference could be observed in the plots, and it will be noticed that the unfertilized plot yielded higher than three of the treated plots and nearly as high as the other two. It is, however, worthy of note that for the past two years, the plot treated with a mixture of the three manures, has given the highest yield.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Plot No. 1.—Nitrate of soda, 100 lbs. per acre (half sown when grain was 2 inches high, balance when 6 inches high)......	May 15	Aug. 28	105	50	Strong..	3½	Bald....	5,920	61	20	62
Lot No. 2.—Nitrate of soda, 200 lbs. per acre (half sown when grain was 2 inches high, balance when 6 inches high)........	" 15	" 26	103	51	" ..	3¾	"	5,480	58	40	62
Plot No. 3.—Superphosphate No. 1, 400 lbs. per acre (sown before grain and harrowed).............	" 15	" 27	104	51	" ..	3½	"	7,280	52	..	62
Plot No. 4.—Check-plot. Unfertilized	" 15	" 28	105	50	" ..	3¾	"	6,600	62	40	61
Plot No. 5.—Muriate of potash, 200 lbs. per acre (sown before grain and harrowed)................	" 15	" 26	103	51	" ..	3¼	"	8,080	65	20	62½
Plot No. 6.—Superphosphate No. 1, 200 lbs. per acre ; muriate of potash, 100 lbs. per acre ; nitrate of soda, 100 lbs. per acre (half sown before grain and harrowed, balance when grain was 2 inches high)..........	" 15	" 27	104	52	" ..	3½	" .. .	8,080	65	20	58½

SPELTZ.

Sown on 1-20th and 3-20th acres of fallowed land by hoe-drill, at the rate of two bushels per acre.

The straw proved very weak and lodged badly, but from appearances while growing, would make good fodder if cut at the proper time.

Speltz is apparently well adapted to the country, and may be grown for the straw or grain for fodder ; the yield of the latter being very satisfactory.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			In.		In.		Lbs.	Bush.	Lbs.	
Speltz	Aug. 24	102	46	Weak	2	Bald	2,275	58	20	46½
"	" 26	104	47	"	1¾	"	2,475	52	4	46½

FALL WHEAT.

When visiting Southern Alberta in connection with Farmer's Institute work, in March last, many fields of fall wheat were noticed on the drive from Magrath to Pincher Creek, which have since given large yields of grain.

With the object of again testing fall wheat on the farm, seed of two varieties was secured and sown on August 5, on a particularly well prepared piece of fallowed land.

The seed was put down as deep as it was possible for the seeder to work, in the hope that the roots may be sufficiently far below the surface to save them from the effects of spring thaws and frosts, which have heretofore been fatal to fall wheat.

When the first killing frost came this fall, the wheat had attained a height of eight inches, and the leaves formed a thick mat entirely covering the ground.

While it is very gratifying to learn that fall wheat has been such a success in Alberta this year, it is not safe to conclude that it will always be so. Last spring was particularly free from thaws and frosts, and as soon as the growth started there was no set-back ; resulting in an excellent crop. In former tests made here with fall wheat, there has never been any difficulty in getting it safely through the hardest winter, and in 1899, which was perfectly free from spring thaws and frosts, it produced a very heavy crop of straw, but the grain was unfortunately struck by rust and completely destroyed. In all other trials, the alternate thawing and freezing from April 20 to May 25 has entirely killed the crop.

These thaws and frosts have hitherto made the growing of clovers very difficult on the Experimental Farm, and so long as the Territories are subject to them, it will be advisable not to risk too much on either fall wheat or clovers.

EXPERIMENTS WITH OATS.

Sixty-four varieties were tested on plots of 1-20th acre each ; fourteen of the same varieties were sown on plots of ½ to 11 acres, and Banner was used in the test of formalin as a preventive of smut.

The crop on the whole surpassed any previously grown on the farm.

With the exception of 8 acres of Banner oats sown on backsetting, and the plots in the rotation test, all the tests were made on land fallowed in 1900 and in good condition for crop.

The seed used was well cleaned by mill and was of excellent quality.

TEST OF VARIETIES.

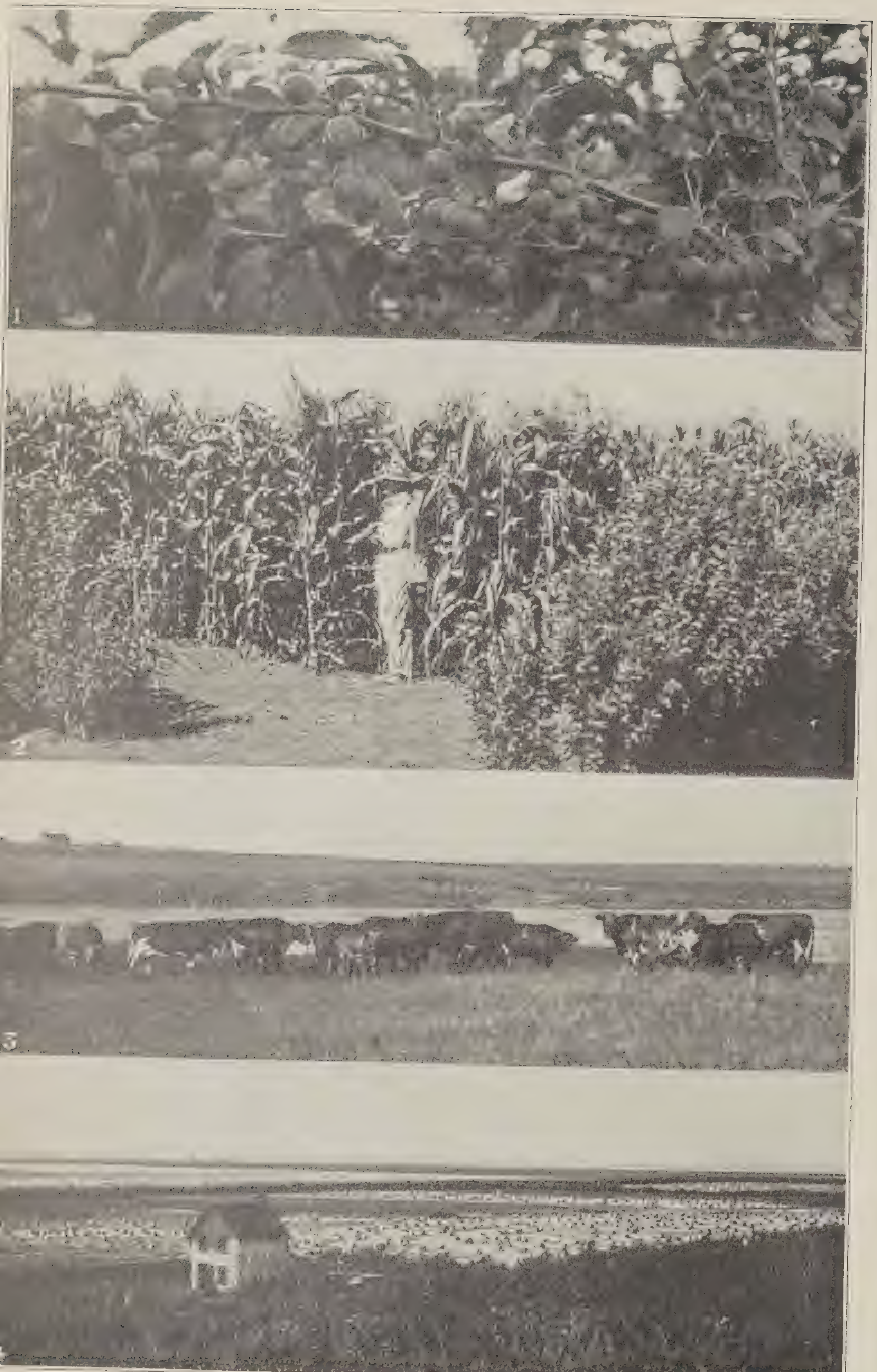
Sown on fallow by hoe-drill, on May 9, at the rate of 2 bushels per acre.

The grain stood up well, and none of the plots sustained any injury from lodging, smut or rust, except Bonanza, which was, for some unknown reason, very smutty.

The rust mentioned in the following detailed result of the test was simply on the leaves and did no damage whatever.

Oats—Test of Varieties.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs	
Abundance	Aug. 18	101	51	Strong	9½	Branching	5,320	147	2	41	
Thousand Dollar	" 18	101	51	"	9½	"	6,320	138	28	41¾	Slightly.
American Beauty	" 19	102	53	Medium	10	"	5,640	137	2	39½	
Improved American	" 18	101	55	Strong	10½	"	4,360	135	30	42	
Mennonite	" 19	102	53	"	10¼	"	5,260	134	4	39	
Lincoln	" 16	99	56	"	9½	"	2,100	130	20	41½	
Banner	" 21	104	60	"	10½	"	4,820	129	14	42	
American Triumph	" 16	99	56	"	10¼	"	4,000	129	14	40½	
Wide-awake	" 16	99	57	"	10¼	"	4,780	129	14	42½	
Danish Island	" 17	100	56	"	9½	"	4,960	128	8	41	
Early Golden Prolific	" 15	98	53	"	9½	"	4,720	127	2	40½	
Golden Beauty	" 18	101	56	"	8¾	"	2,920	126	16	40½	
Improved Ligowo	" 15	98	58	Weak	9	"	5,360	125	30	41	
Early Maine	" 16	99	55	Strong	10¼	"	5,680	124	24	40	
Newmarket	" 17	100	58	Weak	9	"	3,980	124	24	43	Slightly.
Early Blossom	" 21	104	59	Strong	13	Sided	6,900	121	26	41	
Wallis	" 20	103	60	Medium	10½	Branching	4,900	121	6	40½	
Siberian	" 21	104	62	"	13½	Sided	5,720	120	....	38½	Slightly.
Columbus	" 21	104	58	Weak	10	Branching	3,720	120	......	38½	
Abyssinia	" 20	103	56	Strong	10½	"	4,960	119	14	41	
Early Gothland	" 19	102	57	"	10½	Sided	4,820	119	14	43	
Oderbruch	" 19	102	57	"	11	"	4,200	119	14	41	
Holstein Prolific	" 16	99	55	"	11	Branching	4,600	118	8	40½	
Bavarian	" 17	100	54	"	9½	"	4,580	117	22	37	
Goldfinder	" 26	109	53	Medium	10½	Sided	3,620	116	16	39½	
Buckbee's Illinois	" 17	100	55	Strong	11	"	5,500	115	30	41½	
Joanette	" 24	107	48	"	10	Branching	5,600	114	24	38	
Prolific Black Tartarian	" 22	105	57	"	10	Sided	3,640	114	24	38	
White Russian	" 19	102	57	"	8½	Branching	3,920	113	18	43½	
California Prolific Black	" 20	103	61	"	14	Sided	5,180	112	32	37½	
Early Archangel	" 23	96	53	Weak	10½	Branching	2,440	111	26	39	
Rosedale	" 20	103	57	Strong	12	Sided	6,400	111	26	42½	Slightly.
Olive	" 22	105	56	"	9½	"	3,600	111	26	39½	
King	" 15	98	58	"	10	Branching	2,280	110	......	39	
Black Beauty	" 19	102	57	Weak	12	"	4,600	109	14	37	
Kendal	" 25	108	40	Strong	11½	"	3,160	108	28	40	
Golden Giant	" 23	106	57	"	14	Sided	2,100	108	28	35	
Pense	" 23	106	52	"	13¼	"	4,820	107	22	39½	
Holland	" 21	104	62	"	15	"	4,840	105	10	35	
New Zealand	" 25	108	58	"	13	"	4,200	105	10	3[illegible]½	Slightly.
Pioneer	" 23	106	46	"	11½	Branching	4,180	104	24	38½	
Flying Scotchman	" 12	95	63	"	11¼	"	5,200	103	18	41	
Milford	" 23	106	58	"	14	Sided	3,600	102	32	38½	
Cromwell	" 22	105	61	"	13	"	3,560	102	12	40	
Hazlett's Seizure	" 12	95	54	Weak	12¾	Branching	3,460	101	26	42	
Golden Tartarian	" 20	103	59	Strong	12½	Sided	2,660	99	14	36½	Slightly.
Tartar King	" 22	105	58	"	13	"	4,060	93	28	42½	
Sensation	" 20	103	61	"	9½	Branching	4.000	97	22	42½	
Waverley	" 21	104	54	"	11¼	"	4,460	97	2	41¾	
White Schonen	" 14	97	53	Weak	11	"	4,160	97	2	43	
Salines	" 22	105	57	Strong	11	"	4,480	96	16	37½	
Cream Egyptian	" 11	94	58	"	12	"	2,840	96	16	44	
Miller	" 15	98	63	"	13	"	4,560	95	10	39	
Russell	" 19	102	58	"	12	"	4,360	95	10	40	Slightly.
Scotch Potato	" 23	106	63	"	11¾	"	5,620	94	24	37½	
Brandon	" 15	98	65	"	13	"	5,680	92	32	38½	
White Giant	" 15	98	57	"	10½	"	3,880	91	26	39	
Master	" 23	106	58	"	12	Sided	5,040	90	20	40	Slightly.
Black Mesdag	" 13	96	55	"	12	Branching	3,840	87	2	38¾	
Irish Victor	" 22	105	54	Medium	10½	"	3,240	87	2	40	
Longhoughton	" 26	109	55	Strong	11½	"	4,080	81	6	39	Slightly and smutty.
Oxford	" 21	104	58	"	10	"	4,080	80	......	41	
Bonanza	" 12	95	55	Medium	11	"	4,260	72	32	45	Very smutty



Scenes on Experimental Farm, Indian Head, N.W.T.

1. Fruiting branch of plum tree.
2. Indian corn in 1901.
3. Farm herd of cattle.
4. Wheat in stook, crop of 1901.

OATS—Fourteen Varieties Sown on Plots of ½ to 11 Acres.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of head.	Kind of Head.	Yield per Acre.	
	Acres.				In.		In.		Bush.	Lbs.
Abundance, on fallow	5	May 11.	Aug. 22.	103	56	Strong....	10	Branching	124	20
Banner "	11½	" 11.	" 19.	100	59	"	11½	" ..	117	..
Tartar King "	3¼	" 8.	" 18.	102	61	" ...	10¼	Sided.....	104	10
Goldfinder "	1¼	" 8.	" 28.	112	62	Medium..	12	Branching	104	..
New Zealand "	1⅕	" 15.	" 27.	104	58	Weak	12½	Sided.....	100	..
Bavarian "	4½	" 9.	" 16.	99	61	Strong....	10	Branching	99	4
Wide-awake "	6	" 8.	" 15.	99	59	"	10½	" ..	96	..
Waverley "	3½	" 8.	" 19.	103	61	Medium..	10	" ..	94	..
Black Beauty "	¾	" 15.	" 19.	96	56	Weak	10½	" ..	93	..
Thousand Dollar, on fallow......	1	" 15.	" 23.	100	56	Strong....	9	" ..	92	4
Banner, on prairie sod backsetting.	8	" 7.	" 12.	97	58	"	11	" ..	91	30
Lincoln, on fallow.....	½	" 15.	" 22.	99	57	"	11	" ..	91	2
Improved Ligowo, on fallow.....	5	" 8.	" 17.	101	62	Weak	12	" ..	83	..
Early Archangel "	½	" 15.	" 22.	99	53	Strong....	9½	" ..	76	14

TEST OF FORMALIN AS A PREVENTIVE OF SMUT IN OATS.

Sown on May 9, on 1-40th acre plots of fallowed land, by hoe-drill, at the rate of 2 bushels per acre.

Seed.	Condition.	Treatment.	On 25 sq. feet.	
			Good Heads.	Smutty Heads.
Banner..........	Clean.........	6 oz. formalin to 10 galls. water, soaked 1 hour..	897	0
"	"	" " " 20 mins.	860	0
"	"	" " " 5 " ..	911	3
"	"	Untreated	870	23

COMPARATIVE TEST OF SELECTED AND WELL SCREENED OATS FOR SEED.

Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Banner, selected	Aug.	21	104	60	Strong..	10½	Branching	4,760	130	20	41½
" well cleaned............	"	21	104	61	" ..	11	" ..	5,720	122	12	42
" small seed............	"	19	102	60	" ..	10½	" ..	5,540	120	20	44¾

The seed sown in the above test was procured in the same manner as that used in a similar test with wheat. Sown on May 9, on 1-20th acre plots of fallowed land, by hoe-drill, at the rate of one and one-half bushels per acre.

EXPERIMENTS WITH BARLEY.

Thirty varieties of 6-rowed and twenty-two varieties of 2-rowed Barley were tested on uniform plots of 1-20th acre each ; ten of the same varieties were sown on plots of ¼ to 5 acres, and Royal was used in the test of formalin as a preventive of smut.

The crop on the whole, was satisfactory, and some very large yields were obtained on the uniform test plots.

There was, unfortunately, considerable smut in some of the varieties, although all the seed had been treated with formalin.

TEST OF VARIETIES.

Thirty varieties of 6-rowed and twenty-two varieties of 2-rowed Barley were sown on May 14, on 1-20th acre plots of fallowed land, by hoe-drill, at the rate of 2 bushels per acre. All germinated evenly and well.

White and Black Hulless lodged badly, but all the other varieties were erect when cut.

Six-rowed Sorts.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Proportion Smutty.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
Odessa............ ...	Aug. 15	93	43	Weak	3	4,000	68	36	50	
Mensury...............	" 14	92	46	Strong ...	3¼	3,780	67	4	49½	
Claude................	" 11	89	41	" ...	3	3,300	66	12	50	
Royal..	" 12	90	41	" ...	3	3,140	63	16	52	
Trooper	" 11	89	43	" ...	3	3,360	59	28	51½	
Petschora............	" 10	88	37	" ...	3¼	3,380	59	8	49	
Brome.................	" 13	91	41	Medium..	3	4,960	58	16	52	
Blue Long-head.... ...	" 21	99	38	Strong....	3	2,320	57	4	48	
Mansfield	" 14	92	47	" ...	3	3,570	57	4	50	Slightly smutty.
Empire	" 15	93	46	Medium..	3	3,900	56	32	50½	
Summit	" 21	99	43	Strong ...	3	4,200	56	12	52	
Nugent	" 22	100	44	" ...	3	4,490	55	40	52	"
Pioneer	" 20	98	47	" ...	3	2,920	54	8	53½	
Common.............	" 11	89	41	Medium..	3	3,900	53	36	51	
Garfield...............	" 14	92	43	Strong ...	3¼	3,800	53	16	51½	
Oderbruch.....	" 7	85	44	Weak ...	3½	2,100	53	16	50	
Rennie's Improved......	" 9	87	41	Strong ...	3	3,320	52	24	50½	
Stella................	" 13	91	39	" ...	2¼	4,340	51	12	51½	
Baxter...	" 9	87	39	" ...	2½	3,700	50	..	51	A little smut.
Yale..........	" 14	92	45	" ...	2¾	4,570	48	36	49	
Champion.......	" 7	85	46	" ...	3¾	3,620	47	4	49	
Surprise..	" 14	92	40	" ..	3	3,650	46	12	52½	"
Albert	" 10	88	36	" ...	2¼	3,580	45	40	52½	
Vanguard	" 9	87	40	" ...	3	2,760	45	40	50	"
Black Hulless....... ...	" 7	85	34	Medium..	2½	3,480	45	40	63½	
Argyle............. ...	" 10	88	40	Strong ...	3	3,960	44	8	48½	
Success.	" 7	85	39	" ...	3¼	2,980	41	12	49	
Phoenix................	" 9	87	38	" ...	2¼	3,900	40	..	52	Smutty.
White Hulless..........	" 6	84	36	Weak	3¼	3,730	37	4	57	
Excelsior	" 5	83	38	Strong ...	4	2,780	35	..	49½	

TWO-ROWED SORTS.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.	Proportion Smutty.
			In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
Standwell	Aug. 23..	101	45	Strong....	3	3,020	67	44	52	Slightly smutty
Sidney	" 9..	87	44	" ...	3¾	6,100	61	32	53½	
Bolton	" 14..	92	52	Medium..	4¼	4,900	59	28	53	"
Kirby	" 14..	92	47	" ..	3¼	4,420	59	8	51¾	
Leslie	" 10..	88	45	" ..	3¼	3,910	58	36	53½	
Nepean	" 13..	91	52	Strong....	3¾	3,430	58	16	50½	
French Chevalier	" 24..	102	39	" ..	4½	3,740	57	44	51¾	
Harvey	" 5..	83	48	" ...	4¼	4,620	57	24	53½	
Jarvis	" 7..	85	49	" ...	5	5,270	57	4	51¾	
Danish Chevalier	" 24..	102	41	Weak	4¾	3,920	57	4	51	
Prize Prolific	" 24..	102	42	"	5	2,800	56	32	52	
Invincible	" 21..	99	47	Strong....	3¾	3,600	55	40	53½	
Kinver Chevalier	" 25..	103	38	Weak	4	2,720	55	40	51	
Newton	" 23..	101	43	Strong....	4¼	4,300	55	20	53	"
Logan	" 11..	89	50	" ...	3½	6,470	54	28	53½	"
Clifford	" 6..	84	47	" ...	3½	4,480	54	8	53	"
Gordon	" 10..	88	51	" ...	3	4,980	52	24	53	
Canadian Thorpe	" 22..	100	44	" ...	3½	3,580	50	40	53	
Fulton	" 10..	88	48	" ...	3	3,760	50	40	53	
Victor	" 14..	92	44	" ...	4	3,580	47	4	52½	
Dunham	" 8..	86	43	" ...	3	3,720	45	20	51½	A little smut.
Beaver	" 11..	89	40	" ...	4¼	2,920	36	32	49	

BARLEY—TEST OF VARIETIES ON PLOTS OF ¼ TO 5 ACRES.

Nine varieties were sown on fallow and one of the same varieties on Brome backsetting.

The fallow was a field of 24 acres ploughed 7 inches deep in May, 1900, and cultivated four times during the season.

The crop of straw was enormous, and Odessa lodged badly over the entire 5 acres ; while others went down in spots.

Rennie's Improved and Common were affected by smut, which considerably decreased the yield of these two varieties.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.	
	Acres.				In.		In.		Bush.	Lbs.
Sidney, on fallow	5	May 14..	Aug. 15..	92	47	Medium..	4	2-rowed...	60	10
Mensury, on fallow	5	" 14..	" 10..	87	47	Strong....	2¾	6 " ..	59	40
Odessa, on fallow	5	" 13..	" 11..	89	43	Weak	3	6 " ..	58	40
Sidney, on Brome backsetting	4	" 16..	" 15..	90	46	Medium..	3¾	2 " ..	51	..
Invincible, on fallow	½	" 15..	" 22..	99	46	Strong....	3½	2 " ..	49	32
Rennie's Improved, on fallow	5	" 14..	" 8..	85	47	"	2¼	6 " ..	49	20
Trooper, on fallow	3	" 13..	" 7..	85	44	Medium..	2¾	6 " ..	48	16
Standwell, on fallow	½	" 15..	" 22..	99	43	"	3	2 " ..	48	16
Common, on fallow	1	" 14..	" 10..	87	43	"	2¾	6 " ..	48	..
Canadian Thorpe, on fallow	¼	" 15..	" 18..	95	44	Strong....	3¼	2 " ..	44	..

TEST OF FORMALIN AS A PREVENTIVE OF SMUT IN BARLEY.

Sown on May 14, on 1-20th acre plots of fallowed land, by hoe-drill, at the rate of 2 bushels per acre.

Seed.	Condition.	Treatment.	On 25 sq. feet. Good Heads.	On 25 sq. feet. Smutty Heads.
Royal	Smutty	6 oz. formalin to 10 galls. water, soaked 1 hour	872	3
"	"	6 oz. formalin to 10 galls. water, soaked 20 mins.	783	20
"	"	6 oz. formalin to 10 galls. water, soaked 5 mins.	760	36
"	"	Untreated	630	241

Wheat Crop and Average Yield.

Variety.	Cultivation.	Acres.	Yield per Acre.	Total Yield.
Red Fife	Brome backsetting	1	45–50	45–50 bush.
"	Prairie sod, backset	1½	48	72 "
"	Stubble, fall ploughed	10	36–20	362 "
"	Fallow	3⅕	49	157 "
"	Rotation test	4½	....	168–32 "
Preston	Fallow	5	54–54	274–30 "
"	Brome backsetting	4	45–45	183 "
Stanley	"	4	40–45	163 "
Wellman's Fife	Prairie sod, backset	4½	39–20	177 "
Percy	Stubble, fall ploughed	6¾	36–18	245 "
Huron	Fallow	⅗	45	27 "
White Russian	"	½	49–40	24–50 "
Red Fern	Brome backsetting	1⅔	45	75 "
		47 13/60		1974–42

Or an average of 41 bushels 40 lbs per acre.

Oat Crop and Average Yield.

Variety.	Cultivation.	Acres.	Yield per Acre.	Total Yield.
Abundance	Fallow	5	124–20	623 bush.
Banner	"	11⅑	117	1300 "
"	Prairie sod, backset	8	91–30	735 "
Wide-awake	Fallow	6	96	576 "
Bavarian	"	4½	99–4	446 "
Waverley	"	3½	94	329 "
Tartar King	"	3¼	104–10	339 "
Gold Finder	"	1¼	104	130 "
New Zealand	"	1⅕	100	120 "
Thousand Dollar	"	1	92–4	92–4 "
Early Archangel	"	½	76–14	38–7 "
Lincoln	"	½	91–12	45–18 "
Black Beauty	"	¾	93	69–24 "
Improved Ligowo	"	5	83	416 "
		51 5/9		5259–19

An average of 101 bushels 15 lbs per acre.

BARLEY CROP AND AVERAGE YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.	Total Yield.
Odessa	Fallow	5	58-40	294-8 bush.
Mensury	"	5	59-40	299-8 "
Rennie's Improved	"	5	49-20	247-4 "
Sidney	"	5	60-10	301 "
Trooper	"	3	48-16	145 "
Common	"	1	48	48 "
Standwell	"	½	48-16	24-8 "
Invincible	"	½	49-32	24-40 "
Sidney	Brome sod, backset	4	51	204 "
		29½		1587-20

An average of 53 bushels 30 lbs per acre.

EXPERIMENTS WITH PEASE.

Fifty-seven varieties of pease were sown on 1-20th acre plots of fallowed land, on May 15, by hoe-drill, at the rate of 2 bushels small, 2½ bushels medium and 3½ bushels large pease per acre.

The growth was slow at first, but after the rains came it was abnormally heavy, and some excellent yields of very fine pease were secured.

PEASE—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.		Bush.	Lbs.	Lbs
Oddfellow	Sept. 5	113	Strong	47	3	Large	66	.	65½
Pride	" 7	115	"	70	3	"	60	20	64
German White	Aug. 30	107	"	75	3¼	"	60	..	63½
Paragon	Sept. 10	118	"	49	2	Medium	59	40	64
Daniel O'Rourke	Aug. 30	107	"	92	3	Small	59	..	64½
Gregory	Sept. 5	113	"	49	3	Medium	58	40	63
White Wonder	Aug. 27	104	Weak	28	2¾	"	57	..	63¾
King	Sept. 1	109	Strong	79	3	Large	56	..	63
Fenton	" 5	113	"	64	3¼	"	54	40	62½
Crown	" 6	114	Medium	44	2½	Small	54	20	64
Agnes	" 4	112	Strong	70	3	Large	53	40	62½
Golden Vine	" 7	115	"	50	2¼	Small	53	20	63¾
Trilby	" 8	116	"	52	3	Large	53	..	62½
Early Britain	" 8	116	"	50	2½	"	53	..	60
Lanark	" 5	113	"	48	3	"	52	20	63
Elephant Blue	" 6	114	"	38	2	Medium	52	..	62½
Kent	" 8	116	"	72	3¼	Large	52	..	63½
Macoun	" 11	119	"	52	2¼	"	51	20	62½
Large White Marrowfat	" 9	117	"	70	3	"	51	20	63½
Alma	" 8	116	"	56	2¼	Medium	51	20	62½
Bruce	" 10	118	"	60	2¼	Large	51	20	62½
New Potter	" 8	116	"	57	3	"	51	..	61½
Nelson	" 9	117	"	50	2¾	Medium	51	..	65
Carleton	" 8	116	"	50	2½	"	50	40	62½
Prussian Blue	" 3	111	"	64	3	"	50	40	64½
Cooper	" 7	115	"	67	2½	"	50	40	63
Arthur	" 5	113	"	42	2¾	Large	50	20	64½
Black-eyed Marrowfat	" 6	114	"	48	3¾	"	50	20	63½
Elliot	" 10	118	"	48	2½	"	50	20	61½
Mummy	" 2	110	"	67	3	Medium	50	..	62

PEASE—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
				Inches.	Inches.		Bush.	Lbs.	Lbs
Chancellor	Aug. 30	107	Weak	55	2	Small	50	..	65
French Canner	Sept. 5	113	Strong	51	3	"	49	40	64
Prince	" 3	111	"	61	3	Large	49	40	63
Canadian Beauty	" 8	116	"	62	2½	"	49	40	64
Prince Albert	" 5	113	"	52	2	"	49	20	63½
Dover	" 8	116	"	48	2¼	"	49	..	61½
Centennial	" 5	113	"	52	2½	Small	49	..	63
Perth	" 6	114	"	68	3	Large	48	40	62¾
English Grey	" 4	112	"	42	3	"	48	20	62½
Archer	" 8	116	"	48	2	Medium	48	20	63½
Picton	" 1	109	"	63	3	Large	48	..	64
Creeper	" 6	114	Weak	55	2	Small	47	40	64
Fergus	" 8	116	Strong	48	2¼	Large	47	..	63
Vincent	" 8	116	"	48	2¼	"	47	..	62
Duke	" 8	116	"	48	2½	"	46	40	64
Pearl	" 11	119	"	54	2¼	"	46	20	62½
Harrison's Glory	" 10	118	"	49	3	"	46	..	64
Bright	" 12	120	"	60	3	"	46	..	62
Victoria	" 10	118	"	49	3	"	45	20	63
Mackay	" 11	119	"	52	2½	"	45	20	63
Wisconsin Blue	" 5	113	"	38	2½	Small	44	20	63
Bedford	" 8	116	"	42	2	Medium	43	20	62½
Herald	" 5	113	"	56	2	"	41	20	63
Multiplier	" 5	113	"	58	2	Small	40	40	63
Elder	" 10	118	"	48	2½	Medium	40	20	62½
Chelsea	" 5	113	"	49	2	Small	39	20	65½
Grass Pea	" 12	120	"	53	1	"	36	..	..

INDIAN CORN.

TEST OF VARIETIES.

Thirty-four varieties of Indian Corn were sown on May 22, in rows 36 inches apart, by grain-drill; and for comparison, planted by hand in hills three feet apart each way, on the same date.

Both plots were cut for ensilage on September 2. The yield was computed from the weight of corn on two rows, each 66 feet long.

The land used for the test had been fallowed in 1900, and in the fall of that year twenty loads per acre of well-rotted manure was spread evenly over the ground. Before seeding in the spring this was gang-ploughed in, three inches deep, and the plots were well harrowed.

Before and after the corn came up the weeder was used, and until it was too high to permit the working of a horse, a scruffler was run at short intervals. No weeds were allowed to appear.

When cut for ensilage, on September 7, all varieties were well advanced, and the quality and quantity of the fodder is the best we have ever been able to secure here.

Name of Variety.	Character of Growth.	Height.	Condition when Cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		Inches.		Tons.	Lbs.	Tons.	Lbs.
Early Mastodon	Very strong	138	Late milk	26	1,724	13	1,388
Pride of the North	"	101	"	26	800	21	32
Giant Prolific Ensilage	"	103	Tassel	25	1,480	16	1,792
Mammoth Cuban	"	117	Early milk	24	388	19	1,600
Cloud's Early Yellow	"	107	Glazed	24	388	18	168
Salzer's All Gold	"	127	Late milk	24	180	20	1,920
Evergreen Sugar	"	113	"	23	1,784	21	264
Pearce's Prolific	Strong	96	"	23	1,520	17	848
Salzer's Superior Fodder	Very strong	133	Early milk	23	860	17	848
Selected Leaming	"	102	Late milk	23	200	22	880
Country Gentleman	Strong	94	"	22	1,850	13	400
Angel of Midnight	"	99	"	22	1,408	18	1,456
Canada White Flint	Medium	98	Early milk	22	200	17	848
Red Cob Ensilage	Very strong	100	"	22	180	16	1,792
Longfellow	"	131	"	21	1,560	21	240
Early Butler	"	124	Late milk	21	900	18	168
North Dakota White	Medium	92	Glazed	21	504	14	312
Mammoth Eight-rowed Flint	"	95	Early milk	20	1,844	14	776
White Cap Yellow Dent	Very strong	114	"	20	920	16	1,264
Thoroughbred White Flint	"	94	Tassel	20	524	19	280
Compton's Early	Strong	99	Late milk	19	1,996	12	1,872
Yellow Six-weeks	Weak	77	Glazed	19	1,864	11	440
Champion White Pearl	Strong	95	Early milk	19	1,600	16	1,752
Very Early August	Weak	83	Glazed	19	544	12	288
Extra Early Huron Dent	Very strong	117	"	19	544	15	1,416
North Dakota Yellow	Medium	98	Late milk	17	1,738	14	284
Ruby Mexican	"	103	"	17	640	11	1,552
Early Yellow Long-eared	Very strong	116	"	17	452	15	1,944
Kendall's Early Giant	Medium	82	"	17	188	15	1,680
Sanford	Strong	96	Early milk	16	500	12	816
King of the Earliest	Medium	105	Late milk	16	200	17	320
Extra Early Szekely	Weak	92	"	13	1,324	9	1,800
Mitchell's Extra Early	"	75	Glazed	12	1,244	15	1,680
Salzer's Earliest Ripe	"	92	Late milk	12	1,080	11	704

INDIAN CORN.—Test of seeding at different distances sown in drills by grain seeder on May 22. Cut September 2. Cultivation of land the same as for preceding test.

Name of Variety.	Distance between rows.	Character of Growth.	Height.	Weight per Acre grown in rows.	
	Inches.		Inches.	Tons.	Lbs.
Champion White Pearl	21	Strong	116	21	300
"	28	"	116	12	842
"	35	"	116	18	1,968
"	42	"	117	17	686
Longfellow	21	"	113	26	640
"	28	"	125	23	1,940
"	35	Very strong	130	24	251
"	42	"	137	21	1,616
Selected Leaming	21	"	123	25	8
"	28	"	119	24	645
"	35	"	121	21	827
"	42	"	129	19	1,198

ROTATION OF CROPS.

The plan inaugurated in 1899 for a rotation of crops was followed out this year in a satisfactory manner.

No.	1899.	1900.	1901.
1	Wheat	Oats	Soja Beans.
2	Wheat	Wheat	Pease.
3	Wheat	Oats	Tares.
4	Wheat	Wheat	Red Clover.
5	Wheat	Barley	Alsike and Lucerne.
6	Pease	Wheat	Wheat.
7	Tares	Wheat	Oats.
8	Soja Beans	Wheat	Oats
9	Red Clover	Wheat	Wheat.
10	Alsike and Lucerne	Wheat	Barley.
11	Rape	Wheat	Summer-fallow.
12	Wheat	Wheat	Summer-fallow.
13	Wheat	Oats	Summer-fallow.
14	Wheat	Barley	Summer-fallow.
15	Wheat	Wheat	Oats.
16	Wheat	Barley	Oats.
17	Oats	Soja Beans	Wheat.
18	Wheat	Pease	Wheat.
19	Oats	Tares	Wheat.
20	Wheat	Red Clover	Wheat.
21	Barley	Alsike and Lucerne	Wheat.
22	Rye	Summer-fallow	Wheat.

Results obtained in 1901. Soil, Clay Loam.

No.	Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre. Bush.	Yield per Acre. Lbs.
						In.		In.		Bush.	Lbs.
1	Soja Beans	½ acre	May 22	....	....	34	Ploughed under Aug. 21.				
2	Pease	"	" 16	....	....	60	" July 26.				
3	Tares	"	" 16	....	....	28	" " 10.				
4	Red Clover	"	" 16	....	....	16	" Sept. 3.				
5	Clover, Alsike and Lucerne	"	" 16	....	....	30	" " 3.				
6	Wheat, Red Fife	"	" 6	Aug. 26	112	54	Strong	3¾	Bald	38	52
7	Oats, Banner	"	" 6	" 15	101	51	"	10	Branch	97	32
8	Oats, Banner	"	" 6	" 15	101	45	"	10	"	91	8
9	Wheat, Red Fife	"	" 6	" 26	112	54	"	4	Bald	38	..
10	Barley, Sidney	"	" 6	" 15	101	40	"	3	2-rowed.	50	36
11	Summer Fallow	"	....	Ploughed 7 inches deep on June 5, and cultivated 4 times during summer.							
12	" "	"	....	"					"		
13	" "	"	....	"					"		
14	" "	"	....	"					"		
15	Oats, Banner	"	May 6	Aug. 15	101	48	Strong	10½	Branch	80	26
16	Oats, Banner	"	May 6	" 15	101	50	"	10½	"	98	8
17	Wheat, Red Fife	"	" 6	" 26	112	54	"	4	Bald	43	44
18	" "	"	" 6	" 26	112	50	"	4	"	43	18
19	" "	"	" 6	" 26	112	51	"	3¾	"	43	2
20	" "	"	" 6	" 26	112	53	"	4	"	42	16
21	" "	"	" 6	" 26	112	52	"	4	"	43	12
22	" "	"	" 6	" 25	111	51	"	4	"	44	40

SUMMARY OF RESULTS FOR TWO YEARS.

Plot	Variety.	Yield per Acre.		Variety.	Yield per Acre.	
	1900.	Bush.	Lbs.	1901.	Bush.	Lbs.
1	Oats, Banner	11	2	Soja Beans, ploughed under Aug. 21..	.....	.....
2	Wheat, Red Fife	4	20	Pease, " " July 26..	.....	.....
3	Oats, Banner	11		Tares, " " 10..	.....	.....
4	Wheat, Red Fife	5		Red Clover, " " Sept. 3..	.....	.....
5	Barley, Canadian Thorpe	9	44	Clover, Alsike and Lucerne. 5..	.....	.....
6	Wheat, Red Fife	16	50	Wheat, Red Fife	38	52
7	Wheat, Red Fife	19	30	Oats, Banner	97	32
8	Wheat, Red Fife	18	20	Oats, Banner	91	8
9	Wheat, Red Fife	11	20	Wheat, Red Fife	38	
10	Wheat, Red Fife	8	20	Barley, Sidney	50	36
11	Wheat, Red Fife	10	40	Summer Fallow, ploughed June 5		
12	Wheat, Red Fife	7	40	Summer Fallow, "		
13	Oats, Banner	9	14	Summer Fallow, "		
14	Barley, Canadian Thorpe	4	32	Summer Fallow, "		
15	Wheat, Red Fife	4	30	Oats, Banner	80	26
16	Barley, Canadian Thorpe	9	4	Oats, Banner	98	8
17	Soja Beans (Ploughed under)	Aug.	3	Wheat, Red Fife	43	44
18	Pease, Golden Vine (Ploughed under)	July	28	Wheat, Red Fife	43	18
19	Tares (Ploughed under)	"		Wheat, Red Fife	43	2
20	Clover, Common Red (Ploughed under)	Sept.	10	Wheat, Red Fife	42	16
21	Clover, Alsike and Lucerne (Ploughed under)	"		Wheat, Red Fife	43	12
22	Summer Fallow (Ploughed under)			Wheat, Red Fife	44	40

EXPERIMENTS WITH FLAX.

Sowing different quantities of seed per acre and at different dates. Soil, Clay Loam, summer-fallowed. Sown by hoe-drill.

Name of Variety.	Size of Plot.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Acre.				Inches.	Lbs.	Bush.	Lbs.	Lbs.
40 lbs. per acre	$\frac{1}{20}$	May 15..	Aug. 15..	92	30	2,480	18	12	56
80 "	$\frac{1}{20}$	" 15..	" 15..	92	30	2,680	17	38	$55\frac{1}{2}$
40 "	$\frac{1}{20}$	" 22..	" 20..	90	30	2,960	19	36	56
80 "	$\frac{1}{20}$	" 22..	" 20..	90	30	3,380	21	36	$55\frac{3}{4}$
40 "	$\frac{1}{20}$	" 29..	" 20..	83	30	2,520	21	4	56
80 "	$\frac{1}{20}$	" 29..	" 20..	83	30	2,720	22	40	$55\frac{3}{4}$

On account of the lateness of the season only three seedings were practicable.

EXPERIMENTS WITH WHITE FLAX.

The experiment with White Flax, kindly sent for trial by Mr. Alfred Boyd, Toronto, Ontario, was continued this year, and although the season was very favourable for ordinary flax, the white variety was a complete failure. The straw did not grow over 6 inches high, and very little seed formed.

EXPERIMENTS WITH MILLETS.

Seven varieties were sown on May 23, on 1-20th acre plots of land fall-ploughed and manured.

Cut for feed on September 5.

Variety.	Length of Straw.	Length of Head.	Condition when cut.	Yield per Acre.
	Inches.	Inches.		Tons. Lbs.
Italian	41		Not in head	15 1,218
Cat-tail	40		"	15 492
Hungarian	44	4½	Headed	12 1,410
Japanese	47		Not in head	12 175
White Round French	56	9	Headed	9 690
German	33		Not in head	9 510
Pearl	25		"	7 520

EXPERIMENTS WITH RAPE.

Three varieties were sown on May 23, on 1-20th acre plots of fall-ploughing, manured.

Cut for feed on September 14.

Variety.	Length.	Yield per Acre.
	Inches.	Tons. Lbs.
Dwarf Essex	62	41 1,870
Broad Leafed	55	41 1,190
Dwarf Victoria	53	31 1,450

EXPERIMENTS WITH CANARY GRASS.

(*Phalaris canariensis*).

Sown May 15, on 1-20th acre plot of fallowed land, cut August 26; time of mature, 103 days.

Straw, strong ; 46 inches long.

Head, 1¾ inches long.

Weight of straw per acre, 3,060 lbs.

Yield per acre, 25 bushels 30 lbs.

EXPERIMENT WITH SUNFLOWERS.

Mammoth Russian was sown on May 22 ; frozen September 17 ; height, 12 feet.

Very few heads had matured before frost came, and the greater portion of the crop was lost.

EXPERIMENT WITH SPRING RYE.

Sown on May 14, on 1-40 acre lot of fallowed land.

Ripe August 22 ; time to mature, 100 days.

Straw, strong; 51 inches long.

Length of head, 4 inches. Yield per acre, 52 bushels and 8 pounds.

EXPERIMENT WITH SOJA BEANS.

Sown on May 22, on 1-20th acre plots of land manured and fall-ploughed. Cut September 14. No pods formed.

Variety.	Distance between Rows.	Height.	Yield per Acre (Green).
	Inches.	Inches.	Tons. Lbs.
Soja Beans	21	38	7 1,550
"	28	39	6 936
"	35	38	6 1,605

EXPERIMENTS WITH HORSE BEANS.

Sown on May 22, on 1-20th acre plots of land manured and fall-ploughed. Cut September 14. The beans fully matured.

Variety.	Distance between Rows.	Length of Pod.	Height.	Yield per Acre (Green).
	Inches.	Inches.	Inches.	Tons. Lbs.
English Horse Beans	21	3	50	11 1,325
"	28	3	50	11 344
"	35	3	56	11 1,582

EXPERIMENT WITH TURKESTAN ALFALFA.

This seed was sown in the spring of 1900, in one of the garden-plots, and came through the winter in perfect condition.

Requiring the ground for Apple-trees, and not deeming the test a satisfactory one on account of the large amount of protection afforded the crop by the hedges, it was ploughed under in May. In spite, however, of the ploughing and other cultivation, many of the roots continued to grow during the summer, and produced a heavy crop of coarse feed, which the stock did not care for.

HAY CROP.

The crop of Hay secured from both Brome grass and Western Rye grass was very satisfactory.

On recent seedings the crop was above the average and old fields produced a fairly good yield. Part of the fields of Brome-grass and Western Rye-grass where snow had accumulated, gave large returns and brought up the average of some fields, portions of which were exposed to winds, and were consequently bare of snow during the whole winter.

A considerable acreage of both these grasses was left and cut for seed, which has been secured in good condition, free from foul seed of any sort.

One and three-quarter acres, cut for seed, August 3.

BROME GRASS (*Bromus inermis*).

1 acre, first crop, cut July 30 ; yield, 4 tons 1,980 pounds per acre.
10 acres, first crop, cut July 30 ; yield, 1 ton 1,780 pounds per acre.
6 acres, third crop, cut July 9 ; yield, 1 ton 435 pounds per acre.
14 acres, second crop, cut for seed July 31.

WESTERN RYE GRASS (*Agropyrum tenerum*).

Two and three-fifth acres, first crop, cut July 11 ; yield, 4 tons 500 pounds per acre.

Three and a half acres, fifth crop, cut July 23. (Manured spring 1901). Yield, 4 tons per acre.

One and three-quarter acres, cut for seed, August 3.

MIXTURE.

Five acres, mixed Brome and Western Rye grass, first crop, cut July 23 ; yield, 2 tons 360 pounds per acre.

NEW SEEDINGS (1901).

Fifteen and three-quarter acres Brome grass, sown June 19.
Eleven and three-quarter acres Western Rye grass, sown June 18.
One and one-quarter acres Western Rye grass, sown May 25.

SEEDING AND CULTIVATION OF BROME GRASS.

For information regarding the seeding and cultivation of Brome grass the following is quoted from the report of 1896 :—

'This grass is better sown alone ; at least it should not be sown with a grain crop. The grain takes too much moisture from the young grass-plants, only the most vigorous of which will survive the dry weather in September ; whereas, if sown alone all the plants have an equal chance.

'It is advisable to sow the seed on land that does not blow. Summer-fallow would be the best preparation, but on account of its liability to drift it is not safe in many parts of the Territories to use this kind of land. Stubble-land ploughed three or four inches deep in April or May, and well harrowed after the seed is sown is found to be quite safe from winds, as the stubble harrowed to the top prevents all drifting.

'Ten or twelve pounds of seed is required per acre. More seed will give a better crop the first year, but less afterwards, as the roots thicken up each year, and in three or four years this grass makes better pasture than hay.

'The seed being light, long and thin, seeding by hand is the only practicable method unless seeders constructed for the purpose are available. To seed properly a calm day should be chosen, so that all parts of the land may be evenly sown.

'While the plants are young, weeds are sure to make great headway, and it is necessary to keep them at least from going to seed. The quickest way to accomplish this is to go over the field with a mower, cutting just above the grass plants. If this operation has to be repeated it will be necessary to cut the tops of the grass, but this will not injure the plants, in fact it is an advantage in the way of giving the roots a firmer hold.

'The first crop of hay can be cut the next year after seeding, and will, in ordinary years, be ready early in July. Twenty days after being ready to cut for hay it will be fit to cut for seed if so desired.

'On this farm it has always been cut in first bloom for hay, and twenty days from this time it is considered in proper condition to cut for seed.

'In cutting for seed, a binder is used and the grass is cut, tied and stooked the same as wheat or other grain. In a week or ten days after cutting it is ready to thresh or store away.

'For threshing small quantities, the old-fashioned flail is suitable, but for large lots a threshing machine should be used on which the wind has been shut off as much as practicable. From three to six hundred pounds of seed may be expected from an acre.'

EXPERIMENTS WITH FIELD ROOTS.

The land for all the field roots, including potatoes, was fallowed in 1900 by one deep ploughing and several surface cultivations to keep down weeds. In the fall after the ground was frozen, twenty loads per acre of well-rotted manure was spread evenly over the field and before seeding in the spring was ploughed in three inches deep and well harrowed. Frequent cultivation during the growing season was given all the roots.

The yield was computed from the weight of two rows 66 feet long and 30 inches apart.

EXPERIMENTS WITH TURNIPS.

A dry period ensued after the seed was sown and the second seeding did not germinate until after the rains on June 12. The catch of both seedings was very even, but after thinning, the turnip fly did considerable injury to the leaf on the first seeding, which was several weeks earlier than the second. No set-back took place after the second hoeing, and the weather being favourable for growth, a good crop of very fine roots was secured. The soil was clay loam, and twenty-nine varieties were tested. The first sowing was on May 21, the second on May 29, and all were pulled on October 11.

TURNIPS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Monarch	41	104	1,368	24	28	364	939	24
Perfection Swede	39	144	1,302	24	32	944	1,082	24
Selected Purple-top	37	1,900	1,265	..	26	140	869	..
Webb's New Renown	35	1,808	1,196	48	30	1,908	1,031	48
Sutton's Champion	34	1,696	1,161	36	27	1,308	921	48
Shamrock Purple-top	34	1,300	1,155	..	29	1,796	996	36
Prize Winner	33	1,452	1,124	12	26	932	882	12
Selected Champion	33	....	1,100	..	25	952	849	12
Magnum Bonum	33	....	1,100	..	28	1,156	952	36
Hall's Westbury	32	584	1,075	48	24	840	814	..
Halewood's Bronze-top	31	436	1,040	36	15	1,896	531	36
Hartley's Bronze	30	1,116	1,018	36	21	1,560	726	..
Prize Purple-top	30	192	1,003	12	36	72	1,201	12
Elephant's Master	29	344	972	24	24	1,500	825	..
Emperor Swede	28	1,948	965	48	22	1,540	759	..
Skirving's	28	1,288	954	48	27	120	902	..
Kangaroo	28	760	946	..	24	1,632	927	12
West Norfolk Red-top	28	496	941	36	20	1,976	699	36
Imperial Swede	28	232	937	12	26	536	875	36
Champion Purple-top	25	1,744	862	24	20	1,844	697	24
Mammoth Clyde	25	688	844	48	24	576	809	36
Giant King	25	160	836	..	16	1,132	552	12
East Lothian	24	972	816	12	20	1,316	688	36
Jumbo	23	1,265	787	36	19	280	638	..
Marquis of Lorne	23	992	783	12	23	1,124	785	24
Bangholm Selected	22	1,804	763	24	27	1,532	925	32
Carter's Elephant	22	352	739	12	14	1,436	490	36
Drummond Purple-top	21	360	706	..	15	1,680	528	..
New Arctic	20	1,976	699	36	25	1,480	858	..

EXPERIMENTS WITH MANGELS.

As with the turnips the second seeding did not germinate until after the rains on June 12. Except on high places in the field, too much rain kept the soil cold and none of the varieties made much progress until the month of August.

The roots were sound and fine and afford a large amount of feed.

Twenty-five varieties were tested, sown on clay loam. Two sowings were made in each case, the first on May 22, the second on May 29, and all were pulled on October 1.

MANGELS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Prize Mammoth Long Red	30	1,380	1,023	..	29	740	979	..
Ward's Long Oval-shaped	29	740	978	..	21	1,560	726	..
Canadian Giant	28	1,948	965	48	18	168	602	48
Prize-winner Yellow Globe	27	1,208	928	..	29	80	968	..
Lion Yellow Intermediate	27	912	915	12	27	1,572	924	12
Half-long Sugar Rosy	27	780	913	..	24	180	803	..
Selected Mammoth Long Red	26	1,856	897	36	28	1,816	963	36
Mammoth Yellow Intermediate	26	1,328	888	48	22	880	748	..
Giant Yellow Half-long	26	308	871	48	24	576	809	36
Giant Yellow Intermediate	25	952	849	12	22	1,936	765	36
Triumph Yellow Globe	25	292	838	12	24	444	807	24
Giant Yellow Globe	25	28	833	48	26	992	883	12
Half-long Sugar White	24	1,368	822	48	27	384	906	24
Gate-post	24	972	816	12	17	1,940	599	..
Norbiton Giant	24	972	816	12	21	504	708	24
Champion Yellow Globe	23	1,520	792	..	22	1,804	763	24
Leviathan Long Red	23	1,124	785	24	17	1,640	594	..
Yellow Intermediate	23	728	778	48	25	1,612	860	12
Mammoth Oval-shaped	23	332	772	12	28	1,552	959	12
Yellow Fleshed Tankard	22	1,672	761	12	19	1,864	664	24
Mammoth Long Red	21	1,824	730	24	19	1,336	655	36
Gate-post Yellow	20	1,448	690	48	18	960	616	..
Golden Fleshed Tankard	19	940	649	..	22	1,012	750	12
Warden Orange Globe	19	16	633	36	24	708	811	48
Red Fleshed Tankard	*10	1,648	360	48	8	236	270	26

* Did not germinate well.

EXPERIMENTS WITH CARROTS.

Neither of the seedings germinated until about the end of June, and in consequence the season of growth was not sufficiently long to produce a heavy crop, although the yield was much higher than was at one time thought possible.

All varieties of field roots were sown by drill on the flat, on clay loam soil. Twenty varieties of carrots were tested. The sowings were made in each case, the first on May 22, the second on May 29, and all were pulled on October 1.

CARROTS—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
Ontario Champion	12	1,740	429	..	11	572	376	12
New White Intermediate	12	1,608	426	48	11	1,760	396	..
Half Long White	12	1,344	422	24	6	1,860	231	..
Iverson's Champion	12	1,212	420	12	10	592	343	12
White Belgian	12	816	413	36	11	1,668	394	28
Half Long Chantenay	12	816	413	36	8	1,688	294	48
White Vosges, Large Short	12	552	409	12	10	1,252	354	12
Mammoth White Intermediate	12	420	407	..	6	1,728	228	48
Green Top White Orthe	11	1,686	394	28	8	896	281	36
Improved Short White	11	1,232	387	12	12	1,080	418	..
Long Yellow Stump Rooted	11	968	382	48	10	1,780	363	..
Guerande or Ox-Heart	9	1,932	332	12	6	1,200	220	..
Yellow Intermediate	9	1,932	332	12	8	1,424	290	24
Scarlet Intermediate	9	1,400	323	20	9	216	203	36
Carter's Orange Giant	9	1,008	316	48	6	1,728	228	48
Giant White Vosges	8	1,744	295	44	8	1,952	299	12
Early Gem	7	1,312	252	12	7	652	244	12
Long Scarlet Altringham	7	784	246	24	5	448	174	8
Scarlet Nantes	7	388	239	48	6	1,464	224	24
Long Orange or Surrey	5	1,616	193	36	4	1,504	158	24

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of sugar beets were tested, all on clay loam soil, sown by drill on the flat. Two sowings were made in each case, the first on May 22, the second on May 29, and all were pulled on October 2.

SUGAR BEETS.—Test of Varieties.

Name of Variety.	Yield per Acre. 1st Plot.		Yield per Acre. 1st Plot.		Yield per Acre. 2nd Plot.		Yield per Acre. 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Royal Giant	29	1,664	994	24	26	8	866	48
Improved Imperial	27	1,440	924		20	1,844	697	24
Red Top Sugar	27	912	915	12	25	1,348	855	48
Danish Red Top	24	1,896	831	36	25	1,744	862	24
Danish Improved	18	1,784	629	44	23	860	781	
Wanzleben	16	1,396	556	36	19	1,600	660	
Vilmorin's Improved	16	624	543	24	16	472	541	12

EXPERIMENTS WITH POTATOES.

Eighty-nine varieties of potatoes were planted in drills 30 inches apart, in which the sets were dropped 14 inches apart. The seed potatoes were kept in bushel boxes in a cool cellar during the winter. Large sets with two eyes each were used and planted after being cut four days. When planted and when tops were appearing, the ground was well harrowed and afterwards scruffled until the stalks were too large to permit of this work.

The yield was computed from the weight of potatoes in one row, 132 feet long.

A few of the early varieties did not germinate evenly and the yield was poor. The medium early potatoes have given the best returns for the past two years. There was no rot in any of the varieties.

The cultivation of the land before planting was the same as for field roots. They were planted on May 20, on clay loam, and dug October 3.

Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre.		Yield per acre, Marketable.		Yield per acre, of Unmarketable.		Form and Colour
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Carman No. 1	Strong	Large	663	28	646	24	17	4	Oval, white.
Green Mountain	"	"	657	4	635	44	21	20	Long, "
Maggie Murphy	"	Very large	644	16	629	20	14	56	Long, dark red.
Carman No. 3	"	"	629	20	614	24	14	56	Oval, white.
Northern Spy	"	"	616	32	597	20	19	12	Long, dark red.
Rural Blush	Very strong	"	615	..	604	20	10	40	Oval, red.
General Gordon	Medium	"	612	16	597	20	14	56	" pink.
Country Gentleman	Weak	Large	610	8	567	28	42	40	Long, "
Delaware	Strong	Very large	603	44	582	24	21	20	Oval, white.
American Giant	Very strong	"	599	52	576	24	23	28	Long, white.
American Wonder	"	Large	599	28	573	52	25	36	Oval, white.
Dakota Red	"	Very large	595	12	580	16	14	56	Oval, dark red.
New Variety, No. 1	"	"	590	56	582	24	8	32	" white.
Burnaby Seedling	Strong	"	584	32	554	40	29	52	Long, light red.
Irish Daisy	Very strong	Large	582	24	548	16	34	8	Oval, white.
State of Maine	"	"	579	8	548	16	29	52	"
Dreer's Standard	Strong	"	576	..	554	40	21	20	"
Chicago Market	Medium	Very large	573	52	539	44	34	8	"
Rose, No. 9	Very strong	"	571	44	548	16	23	28	Oval, dark red.
Seedling, No. 230	Medium	Large	569	36	539	44	29	52	Oval, white.
Uncle Sam	Very strong	Very large	567	28	544	..	23	28	"
Quaker City	"	"	567	28	544	..	23	28	"
Late Puritan	"	"	556	48	533	20	23	28	Long, white.
Columbus	Strong	"	556	48	535	28	21	20	Oval, pink.
Clay Rose	Very strong	Large	548	16	533	20	14	56	" red.
Swiss Snow-flake	Weak	Medium	548	16	507	44	40	32	" white.
Great Divide	Very strong	Large	548	16	529	4	19	12	Long, red.
Cambridge Russet	Strong	"	546	8	524	48	21	20	" russet.
Lizzie's Pride	"	"	541	52	520	32	21	20	Oval, white.
Penn Manor	"	"	531	12	468	24	44	48	Long, light red.
Holborn Abundance	Very strong	Very large	531	12	512	..	19	12	Round, white.
Bill Nye	Strong	"	526	56	499	12	27	44	Long, white.
I. X. L.	Very strong	"	526	56	499	12	27	44	" light pink.
Empire State	"	"	524	48	503	28	21	20	" white.
Canadian Beauty	Strong	Medium	520	40	486	24	34	8	" pink.
Seattle	Very strong	Large	520	32	486	24	34	8	" white.
Early Sunrise	Weak	"	505	36	471	28	34	8	" pink.
Seedling No. 7	Very strong	"	505	36	482	8	23	28	Oval, red.
Flemish Beauty	Strong	Medium	499	12	471	28	27	44	Long, dark red.
Money Maker	Medium	Large	497	4	469	20	27	44	" white.
Pearce's Prize-winner	Very strong	"	492	48	458	40	34	8	" "
Sharpe's Seedling	"	"	486	24	439	28	46	56	" pink.
Irish Cobbler	Strong	"	486	24	456	32	29	52	Oval, red.
Troy Seedling	"	"	482	8	458	40	23	28	" white.
Sabean's Elephant	"	Small	480	..	462	56	17	4	Long, white.
Early Michigan	Weak	Small	480	..	420	16	59	44	Long, white.
Hale's Champion	Very strong	Large	477	52	448	..	29	52	Oval, white.
Prize Taker	Strong	"	477	52	454	24	23	28	Long, dark pink.
Reading Giant	Very strong	"	475	44	439	28	36	16	Oval, red.
New Queen	Strong	Very large	458	40	437	20	21	20	Long, red.
Pride of the Market	Weak	Large	458	40	437	20	21	20	Oval, white.
White Beauty	Strong	Medium	443	44	405	20	38	24	" "
Early Harvest	Weak	Very large	437	20	422	24	14	56	Long, white.
Brownell's Winner	Strong	Large	433	4	418	8	14	56	" red.
Polaris	Very strong	Medium	433	4	398	56	34	8	Oval, white.
Beauty of Hebron	Strong	Large	430	56	407	28	23	28	" pink.
Early St. George	Weak	Small	428	48	384	.	44	48	Long, pink.
Houlton Rose	Strong	Very large	428	48	422	24	6	24	" red.

Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre.		Yield per acre of Marketable.		Yield per acre of Unmarketable.		Form and Colour.
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Bovee	Medium	Medium	416	..	369	4	46	56	Oval, pink.
Reeve's Rose	Strong	"	405	20	375	28	29	52	Long, red.
Sir Walter Raleigh	Very strong	Very large	398	56	390	24	8	32	Oval, white.
Lee's Favourite	Strong	Large	396	48	377	36	19	12	Long, red.
Brown's Rot-proof	Medium	Medium	396	48	371	12	25	36	Oval, dark red.
Early Six weeks	Weak	"	392	32	371	12	21	20	" pink.
McIntyre	Strong	"	392	32	379	44	12	48	Long, blue.
Thorburn	Weak	"	392	32	366	56	25	36	Oval, pink.
Early White Prize	"	"	390	24	352	..	28	24	Long, white.
Rochester Rose	Very strong	"	390	24	364	48	25	36	" red.
Pearce's Extra Early	Weak	Strong	379	44	334	56	44	48	Oval, pink.
Early Norther	Very strong	Very large	375	28	371	12	4	16	Long, dark pink.
Enormous	"	Large	373	20	362	40	10	40	Oval, white.
Earliest of All	Strong	Very large	371	12	366	56	4	16	Long, pink.
Vanier	Very strong	"	369	4	360	32	8	32	Oval, dark red.
Prolific Rose	"	Medium	366	56	337	4	29	52	Long, dark pink.
Early Ohio	Weak	Large	362	40	354	8	8	32	Oval, pink.
Daisy	"	Medium	334	56	302	56	32	..	Long "
Rural, No. 2	Very strong	Very large	315	44	309	20	6	24	Oval, white.
Maule's Thoroughbred	"	Medium	311	28	285	52	25	36	Long, red.
Rawdon Rose	Weak	Small	309	20	281	36	27	44	" pink.
Ohio Junior	"	Medium	300	48	277	20	23	28	Oval "
Early Market	"	Small	398	40	264	32	34	8	" "
Vick's Extra Early	Strong	Large	292	16	279	28	12	48	Long "
Burpee's Extra Early	Weak	Medium	292	16	270	56	21	20	Oval "
Everett	Very strong	Very large	281	36	277	20	4	16	Long, red.
Wonder of the World	Medium	Small	268	48	232	32	36	16	Oval, pink.
Early Andes	Weak	Medium	260	16	232	32	27	44	" "
Early Rose	Medium	Large	243	12	228	16	14	56	Long, red.
Early Puritan	Weak	"	177	4	174	56	2	8	" white.

THE VEGETABLE GARDEN.

The past season was satisfactory for most of the varieties of Vegetables. Beets, Carrots, Celery, Onions, Pease, Beans and Parsnips were exceptionally good ; while Cabbage, Cauliflowers and Tomatoes did fairly well. Marrows, Squash, Pumpkins and things of this nature set a very light crop, but some very fair sized fruit was produced.

Asparagus.

On account of the dry weather early in the season, the crop of Asparagus was very light till rains came in June.

Conover's Colossal—In use May 17 to July 15

Barr's Elmira—In use May 17 to July 25.

Barr's Mammoth—In use May 17 to July 25.

BEANS.—Sown in open, May 9.

Variety.	Green, In use.	Ripe.	Remarks.
Imported Seed.			
Black Speckled	July 31	Sept. 12	Good cropper; late.
Fame of Vitry	" 21	" 5	" "
Canadian Wonder	Aug. 1	" 12	" "
Dwarf Emperor of Russia	July 21	Aug. 25	" early.
Dwarf Extra Early	" 19	" 17	" "
Experimental Farm Seed.			
Detroit Wax	July 19	Aug. 29	Good cropper; early.
Dwarf Kidney	" 19	" 20	" "
Currie's Rust-proof	" 15	" 17	" very early.
Stringless Wax	" 15	" 20	" early.
Early Six-weeks	" 21	" 17	Light crop; early.
Little Giant	" 26	" 17	The best; early.
Challenge Black Wax	" 15	" 20	One of the best; early.
Golden Wax	" 19	....	Good green; did not ripen.
Dwarf Triumph	" 19	Aug. 29	Good cropper; early.
Red German Wax	" 26	....	Light crop; did not ripen.
Flageolet Scarlet Wax	" 26	Sept. 10	Fair cropper; late.
Snow-pod	Aug. 1	....	Light crop; did not ripen.
Early Mohawk	July 19	Aug. 20	Early green; fair cropper.

BEETS.—Sown May 2. Pulled October 1.

Variety.	In use.	Bushels per Acre.	Remarks.
		Bush.	
Long Smooth Blood Red	July 16	627	Large; good shape.
Early Blood Red Turnip	" 22	528	Large; good shape and colour.
Nutting's Dwarf Improved	" 16	475	Large; coarse.
Egyptian	" 25	331	Good shape and colour; the best.
Dell's Black Leaf	" 15	286	Large; bad shape.

BROCOLI.—Sown in hot-house, March 28. Transplanted April 19.

Variety.	In use.	Weight.	Remarks.
		Lbs.	
Extra Early White	July 20	7	Good and solid.
Large White Mammoth	" 20	5	"

BRUSSELS SPROUTS.

Brussels Sprouts, Improved Extra, Half-dwarf Paris Market and Dwarf Improved, sown in hot-house March 27. Transplanted April 19. Set out May 20.

On account of dry weather early in the season, the plants were stunted and no sprouts formed.

GARDEN CORN.—Planted May 20.

Variety.	Green, In use.	Ripe.	Remarks.
Mitchell's Extra Early	Aug. 17	Sept. 15	Good crop; some fine ears.
Extra Early Cory	" 17	" 15	" "
First of All	" 17	" 15	"
Adam's Extra Early	" 20	" 15	"
Crosby's Early Sugar	" 20		Did not ripen.
Early Minnesota			"
Mammoth White Cory	Aug. 20	Sept. 15	Late; very little ripened.
Canada Yellow	" 16	" 10	Good table corn.
Squaw	" 17	" 5	Early; good crop.
Early Giant, 1900	" 25		Did not ripen.
Early White Cory, 1900	" 20	Sept. 15	Fair crop.
First of All, 1900	" 17	" 15	"

CARROTS.—Sown April 25. Taken up, October 2.

Variety.	In use.	Bushels per Acre.	Remarks.
		Bush.	
Parisian Forcing	July 21	251	Large; good shape.
French Horn	" 21	322	Small "
Luc Half-long	" 28	412	Short; good root.
Long Blood Red	" 25	421	Smooth; good shape.
Chantenay, 1900	" 21	421	Large, smooth; good shape.
Scarlet Nantes, 1900	" 21	358	Small " "

CABBAGE.—Sown in hot-house, March 28. Transplanted to cold-frame, April 15. Set out in open, May 20. Taken up, October 6.

Variety.	In use.	Weight.	Remarks.
		Lbs.	
Express	August 6	6	Very fine heads.
Paris Market	" 2	6	Good heads.
Flat Parisian	" 6	10	"
Winningstadt Early	" 6	7	"
Drumhead St. John's Day	July 19	9	Very early, good heads.
Fottler's Improved Brunswick	August 6	10	Good heads.
Early Jersey Wakefield	July 19	7	Very early, fair heads.
Very Early Etampes	" 19	7	" "
Large Red Drumhead	August 10	15	Late, very fine heads.
Red Polish Short Stem	" 10	13	" "
Green Globe Savoy	" 6	8	Soft.

CAULIFLOWER.—Sown in hot-house, March 27. Transplanted to cold-frame, April 15. Set out in open, May 20.

Variety.	In use.	Weight.	Remarks.
		Lbs.	
Early Snow-ball	July 19	6	Fine heads.
Extra Selected Earliest Erfurt	" 21	6	Very fine heads.
Extra Early Paris	....	....	Did not germinate.
Chambourcy Mammoth	July 19	8	Large, solid heads.
Large Algiers	" 19	7	"
Autumn Giant	August 2	7½	"
Autumn King, 1900	" 2	7	"
Half Early Paris	....	....	Did not germinate.

CUCUMBERS.—Planted in hot-house, April 4; re-potted, April 21. Set out in open, May 17.

Variety.	In use.	Remarks.
Improved Long Green	July 30	Light crop. Small.
English Favourite	" 25	" "
Short Green Gerkin	" 10	" "
Early Frame	" 20	Fair crop. Small.
Giant Pera	" 20	Good crop. Large fruit. Best.

CELERY.—Sown in hot-house, March 27; transplanted, April 22. Set out in trenches, June, 3; taken up, October 7.

Variety.	In use.	Height.	Weight.	Remarks.
		Inches.	Pounds.	
Giant Pascal	October 7	30	3½	Large coarse.
Paris Golden Yellow	" 7	18	3	Very fine heads.
Rose-ribbed Paris	" 7	24	2½	"
Red Large-ribbed	" 7	24	2	"
White Plume	August 27	24	2	Excellent quality, small.
Giant Golden-heart	October 7	36	4	" large.
Pink Plume	August 31	30	2½	" small.
White Walnut	" 31	24	3	"
New Triumph	October 7	24	3	"

LETTUCE.—First seeding, April 30; in use, May 30; second seeding, May 30; in use, June 25.

Variety.	Heads.	Remarks.
Spring Cabbage Varieties.		
Forcing Milly	Large	Good.
White Tennis-ball	Small	Very fine.
Wheeler's Tom Thumb	"	"
Red Edged Victoria	"	Good.
Summer Sorts.		
Algiers	Large	Very fine.
All the year round, black seed	"	Good.
All the year round, white seed	Medium	"
White Marvel of Cazard	"	"
Blonde Stone-head	Small	"
Brown Stone-head	Large	"
Early Ohio or Nonpareil	"	"
Neapolitan	Small	"
Marvel or Red Besson	Medium	"
Big Boston	Large	Very fine.
Hammersmith	"	Good.
Hardy Red Winter	Medium	"
Cos.		
Green Paris	Large	Very fine.
White Paris	"	"

ONIONS.—Sown in open, April 25. Sown in hot-house, April 8. Transplanted, May 30. Lifted, September 12.

Variety.	Yield, Sown in Open.	Yield, Transplanted.	Remarks.
	Bush.	Bush.	
Trebons	403	384	Good variety; large, solid.
Straw-coloured White Spanish	403	304	Large, solid.
Wethersfield, Large Red	313	242	"
Blood Red	286	242	"
Paris Silver-skin	233	120	Good pickling.
White Dutch	233	130	Good bulbs.
James' Keeping	206	161	Small, solid.
Market Favourite Keeping	175	108	Small; very good.
Danver's Yellow Globe	175	153	Good bulbs.

MELONS.

Musk.—Dominion Green-flesh and Early Hackensack; sown in hot-house, April 4; transplanted, April 21; set out, May 17. Light crop set and none ripened.

Water.—Stoke's Extra Early; McIver's Sugar and South Dakota; sown in hot-house, April 4; transplanted, April 21; set out, May 17. Light crop set and none ripened.

PEASE.—Sown May 8.

Variety.	In Use.		Ripe.		Size.	Remarks.
American Wonder	July	9	July	30	Small	Light crop.
Admiral	"	21	Aug.	16	"	Good crop.
Anticipation	"	28	"	26	Large	"
Alaska	"	9	July	30	Small	Light crop.
Burpee's Profusion	"	28	Aug.	25	Medium	Good crop.
Premium Gem	"	21	"	30	"	"
C. P. R.	"	31	Sept.	10	Large	"
Champion of England	"	31	Aug.	25	"	"
Daisy	....	....	....	....	....	Seed did not germinate.
Ever-bearing	July	21	Aug.	25	Medium	Good crop.
Extra Early	"	9	July	30	Small	Light crop.
First of All	"	9	"	30	"	Good crop.
Gradus	"	15	Aug.	25	Large	"
Horsford's Market Garden	"	23	"	25	Medium	"
Heroine	....	....	....	....	....	Seed did not germinate.
Laxton's Charmer	July	21	Aug.	16	Large	Good crop.
Nott's Excelsior	"	9	July	30	Small	"
Stratagem	"	31	Sept.	6	Large	"
Shropshire Hero	"	21	"	5	Medium	"
Prince of Wales	"	21	"	5	"	"
Queen	"	31	"	20	Large	"
Rural New Yorker	"	12	Aug.	5	Small	Light crop.
Telephone	"	26	"	30	Large	Good crop.
Yorkshire Hero	"	23	Sept.	25	Medium	"
First and Best	"	9	July	30	Small	"
Wm. Hurst	"	9	"	30	"	Light crop.

SQUASH AND MARROWS.—Sown in hot-house, April 13 ; transplanted, April 22 ; set out, May 17.

Variety.	Weight.	Crop.	Remarks.
	Lbs.		
Yellow Bush	12½	Good	Very fine fruit.
White Bush	8	Medium	" "
Mammoth Whale	....	....	Seed blown out.
Mammoth Red Hubbard	9	Good	Small, good fruit.
Crookneck	8	Medium	Large and soft.
Long White Bush	8	Good	" "
Vegetable Marrow	7½	"	" "

TURNIPS.—Sown, May 20 ; in use, July 21 ; pulled, October 7.

Variety.	Per Acre.	Remarks.
	Bush.	
Extra Early White Milan	735	Coarse, bad shape.
Early White Strap-leafed	645	Bad shape.
Half-long White Vertus	645	Good variety.
Yellow Golden Ball	592	"
Early Stone	511	"

TOMATOES.—Sown in hot-house, March 28 ; transplanted, April 19 ; set out, May 17.

Variety.	Green Fruit.	Ripe.	Size.	Remarks.
Dwarf Champion	July 10	Sept. 1	Small	Late, rough.
Imperial	" 19	Aug. 25	Large	Rough.
Early Michigan	" 10	" 20	Small	Smooth.
New Stone	" 15	Sept. 1	Large	"
Early Acme	" 10	Aug. 26	"	Rough.
Peach	" 20	" 28	Small	"
Atlantic Prize	" 10	" 28	"	Smooth.
Extra Early Red	" 15	" 20	"	"
Canada	" 15	Sept. 1	Medium	"
Early Ruby	" 10	Aug. 20	Small	Rough.
Earliest of All	" 10	" 20	Medium	"
Red Cherry	" 20	" 30	Small	Smooth.
Yellow Plum	" 20	" 30	"	"
Ponderosa	" 20	Sept. 1	Large	"

CITRONS.

Sown in hot-house, April 4 ; transplanted, April 21 ; set out, May 17.
Red Seeded.—Weight, 8 pounds ; crop, fair ; small, even-sized fruit.
Preserving.—Weight, 5 pounds ; crop, fair ; small, even-sized fruit.

PUMPKINS.

Sown in hot-house, April 13 ; transplanted, April 22 ; set out, May 17.
Connecticut Field.—Weight, 41 pounds ; crop, good ; large, fine fruit.
Winter Surrey.—Weight, 35 pounds ; crop, good ; large, fine fruit.

PARSNIPS.

Sown, April 25 ; in use, October 1 ; taken up, October 1.
Hollow Crown.—233 bushels per acre ; large, fine roots.
Elcomb's Giant.—144 bushels per acre ; large, fine roots.

PEPPERS.

Large Red.—Sown March 28 ; fair crop, but did not ripen.

RADISHES.

First seeding, April 30 ; in use, May 25. Second seeding, May 30 ; in use, June 20.

Forcing Varieties.

Turnip Scarlet ; good variety.
Scarlet White Tipped ; good variety.
Deep Scarlet ; good variety.
Deep Scarlet Short-leaf ; good variety.

Turnip Varieties.

Early Scarlet, Early Scarlet White Tipped, Deep Scarlet, Early White small ; Very Early Yellow.
All good varieties.

Olive-Shaped.

Scarlet White Tipped, Half-long Deep Scarlet.

All good varieties, but on account of the dry weather early in the season, none of the Radishes germinated properly.

Winter.

Russian white, large, good ; Black Spanish, large, good ; China Scarlet, small.

PARSLEY.

Sown May 2 ; in use, July 1. Did well.

SAGE.

Sown May 2 ; in use, July 1. Made good growth.

TOBACCO.

Sown in hot-house, March 29 ; transplanted April 22 ; set out, May 22 ; frozen September 17. Not mature.

RHUBARB.

Victoria, in use from May 26 to September 15. Did well, good crop, fine stalks.
Linnaeus, in use from May 26 to September 15. Did well.

NEW SEEDING.

Giant and Linnaeus, sown May 1 ; transplanted July 25. Made good growth.

THE FLOWER GARDEN.

The flower garden was never more beautiful or so long in bloom as during the past season. Commencing on May 5 with Tulips, Crocuses and Pansies, a succession was kept up with Annuals and Perennials until November 2, when heavy frosts during several nights killed a large bed of Pansies, which never looked better than during the last week of October.

The Tulips did not make as good a showing as in former springs. Hot, dry weather set in just as they were coming in flower and a few days, from 14th to 19th May with temperature ranging from 85 to 95 degrees in the shade, killed the bloom.

All other Perennials, especially the Iris and Paeonies, did particularly well.

ANNUALS.—Propagated in hot-house. Sown in hot-house, March 27.

Variety.	Set Out.	In Bloom.		Remarks.
		From	To	
Agrostemma	May 22	June 29	Sept. 17	Did well. Small pink.
Amaranthus Superbus	" 22	July 20	" 17	Some fine plants.
" Tricolour	" 22	" 20	" 17	" "
" Willow-leaved	" 22	" 20	" 17	" "
Ageratum, Mexican Dwarf	" 22	" 8	" 17	Fine border plant.
Adonis Vernalis	" 22	....	17	Did not grow.
Abronia Umbellata	" 30	July 16	" 17	Very fine flowers.
Aquilegia Chrysantha Nana	" 30	....	17	Did not grow.

ANNUALS—*Concluded.*

Variety.	Set Out.	In Bloom. From	In Bloom. To	Remarks.
Ænothera Drummondii	May 30	July 6	Sept. 17	Fine flowers.
Aster, Large Flowering	" 27	" 9	" 17	All varieties did well and the display throughout the season was very fine. Were in full bloom when frozen on September 17.
" Pyramidal Bouquet	" 27	" 9	" 17	
" Lilliput	" 27	" 9	" 17	
" Perfection	" 27	" 9	" 17	
" Half-dwarf	" 27	" 9	" 17	
" Queen of the Market	" 27	" 9	" 17	
" Mixed	" 27	" 9	" 17	
" Giant Comet	" 27	" 9	" 17	
" Queen of the Earliest	" 27	" 9	" 17	
" Japanese Tassel	" 27	" 9	" 17	
" Imbricated Pompon	" 27	" 9	" 17	
Briza Maxima	" 20	" 15	....	Very pretty grass.
Balsam, Double	" 20	June 15	Sept. 17	Very fine bloom.
Chrysanthemum, Double	" 30	July 5	" 17	Very strong growth but flowers were small.
" Frutescens	" 30	" 5	" 17	
" Car. Hyb.	" 30	" 5	" 17	
Coreopsis, Drummondii	" 30	June 20	....	A good display of bloom.
" Atkinsoniana	" 30	" 20	....	" "
Cosmos, Hybrid	" 30	" 20	....	Very strong growth.
Celosia, Pyramidalis	" 30	July 20	Sept. 17	Good plants.
" " Mixed	" 30	" 20	" 17	
Candytuft	" 30	June 6	" 1	Very fine showing.
Canterbury Bell	....	....	....	Did not germinate.
Centaurea Odorata	May 39	July 5	Sept. 17	Very fine showing.
Calendula	" 30	June 20	" 17	Fine, large bloom.
Dianthus, Mixed	" 30	July 5	" 17	The four varieties made an excellent show.
" Chinese Double	" 30	" 5	" 17	
" Plumarius Double	" 30	" 5	" 17	
" Chinese Single	" 30	" 5	" 17	
Dahlia, Single Dwarf	" 21	" 9	" 17	Did well.
Delphinium, Elatum	" 30	Aug. 30	....	Did not do well.
" Dwarf Candelabra	" 30	" 30	....	" "
" Large flowering	" 30	" 30	....	" "
Dianthus, Marguerite	" 30	July 5	....	Made excellent show.
" Indian Pink	" 30	" 5	....	" "
" Mixed	" 30	" 5	....	" "
Gaillardia, Grandiflora	" 30	June 20	Sept. 17	Very good show.
" Picta	" 30	" 20	" 17	" "
Godetia, Mixed	" 30	" 14	" 17	Did well. Good show.
" Tall Mixed	" 30	" 14	" 17	" "
" Splendens	" 30	" 14	" 17	" "
Gypsophila elegans	" 30	July 8	" 17	Small, tender pink flowers.
Helichrysum	" 30	" 20	" 17	Some fine flowers.
Hollyhock, Double Mixed	" 30	....	....	Made fair growth.
Iberis Gibralteriana	" 30	Aug. 15	Sept. 27	Very pretty late in season.
Lobelia	" 3)	June 22	" 17	Did well. Good border plant.
Linum Grsndiflorum	" 30	July 8	....	Did fairly well.
Marvel of Peru, Mixed	" 30	" 21	Sept. 17	Stronggrowth. Very fine flowers.
" Variegated	" 3)	" 21	" 17	
Nigella	" 22	" 5	" 10	Did well. Pretty flower.
Nicotina	" 22	June 29	" 17	Did fairly well.
Sultan Marguerite	" 28	" 2	....	Very fine bloom.
Sweet Alyssum	" 22	" 25	....	Fine bloom.
Stocks, German Large	" 20	" 24	Sept. 17	Made very fine show. Flowered till frozen, and some of the spikes were very beautiful.
" Double	" 20	" 24	" 17	
" Victoria	" 20	" 24	" 17	
Verbena, Hybrid	" 21	July 1	....	Made good show.
Salpiglossis	" 30	" 20	Sept. 17	Some good flowers.
Scabiosa	" 30	" 5	" 17	Did well.
Swan River Daisy	" 30	" 20	" 17	Did well. Very pretty flower.
Phlox, Mixed	" 22	June 16	" 17	Very fine show.
" Dwarf	" 22	" 16	" 17	" "
Zinnia, Double	" 21	" 22	" 17	Some large blooms.
Petunia, Grandiflora	" 22	" 20	" 17	Extra fine.
" Giant of California	" 22	" 20	" 17	"
" hybrida flore pleno	" 22	" 20	" 17	"
Portulaca, Double Mixed	" 22	July 10	" 17	Did well.

ANNUALS—SOWN IN THE OPEN.

Variety.	Sown.	In Bloom.	Remarks.
Helianthus	May 4	July 25	Good growth, large blossoms.
Nasturtium	" 4	" 6	Good show, fine blossoms.
Sweet Pease	" 3	" 20	Did well after rains came.
Poppy	" 7	" 30	Did not do well.
Ageratum	" 4	... .	Seed did not germinate.
Alyssum	" 4	July 1	Good show.
Aster	" 4	" 15	Some fine blooms.
Antirrhinum	" 4	" 10	Very fine.
Candytuft	" 4	" 5	"
California Poppy	" 4	" 10	"
Chrysanthemum	" 4	" 12	Good show.
Coreopsis	" 4	" 8	Did not do well.
Calliopsis	" 6	" 8	Fine show.
Centaurea	" 6	" 8	Large blossoms.
Helichrysum	" 6	" 20	Good show.
Dianthus	" 6	" 15	Very fine blooms.
Linum Grandiflorum	" 6	" 8	Good show.
Swan River Daisy	" 6	" 15	"
Gaillardia	" 6	" 15	"
White Swan Poppy	" 6	" 10	"
Gysophila Elegans	" 6	" 10	Small pink flower.
Mignonette	" 6	" 1	Did well.
Phlox Drummondii	" 4	" 10	"
Zinnia	" 4	" 8	Fine large bloom.
Marigold	" 4	" 23	Made fine show.
Salpiglossis	" 4	" 20	Some very fine bloom.

PERENNIALS (OLD BEDS).

Beds of Pansies, Sweet William, Larkspur, Columbine, Lychnis and Everlasting Pea, came through the winter in good condition and flowered freely during the season.

The Pansies and Sweet William were particularly fine, the former continuing to bloom until frozen solid in November.

BULBS

Tulips.

In bloom on May 5. On account of hot dry weather, when Tulips came in bloom, the flowering was irregular ; the flowers were small, and some dried up before opening.

Gladioli.

Transplanted May 29 ; in bloom July 21. Were in full bloom about the end of July, and the bed was one of the most attractive in the garden.

Cannas.

The following varieties were set out on May 20 and came in bloom July 15. Some of the specimens were magnificent in bloom. The following were tested :—

Austria, Allemania, Aphrodite, Asia, Burbank, Baron de Poily, C. Bernardin, Comte de Bouchard, Explorateur Campbell and Florence Vaughan.

Dahlias.

In bloom on July 1. Twenty-two varieties were tested and some very large and beautiful flowers were grown. Among the finest, were :

Liliputian, Little Pigmy, Snow-clad, Woman-in-white and Cactus Queen.

The latter was very like a Chrysanthemum, and had not the stiff appearance generally noticed in Dahlias.

The following were also tested :—

Bird of Passage.
Cochineal.
Chairman.
Chimson Beauty.
Constance.
Clifford W. Burton.
Fairy Queen.
Gem.
Hector.
Herbert Turner.
Herbert.
John Sladd
Lyndhurst.
Lady Antrobus.
Mantas la Villa.
Mrs. Peart.
Mrs. Langtry.
Nemesis.
Perfect Vallose.
Sambo.
Victory.
Wm. Agnew.

Iris.

Of the Iris received from the Central Experimental Farm, and planted in 1900, the following died during the winter of 1900-01 :

Iris Germanica,
" " *Asiatica,*
" *goldenstadtiana coerulescens,*
Iris plicata Lord Seymour,
" " Reine des Belges,
" " Swertii,

The following maintained a very fine succession of bloom from May 24 to July 20, and on account of the deep green of the foliage, the bed was attractive during the whole season :

Iris amœna, Crebillon,
" " Mrs. H. Darwin.
" " Julia Grisi.
" " Maria Theresa.
" " Victor Lemoine.
" *aurea.*
" *Balkana.*
" *biflora.*
" *biglumis.*
" *Blondovi.*
" *cristata.*
" *chamaeiris.*
" *ensata.*
" *flavescens.*
" *florentina.*
" *furcata.*
" *Germanica.* Verschuur.
" *gigantea.*
" *Hungarica.*
" *neglecta,* Agathe.
" " Arlequin Milanais.
" " Hericartiana.
" " Sappho.
" *nudicaulis.*
" *orientalis.*
" *oxypetala.*
" *pallida.*
" *prismatica.*
" *pumila.*
Iris pumila cinerea.
" " *gracilis.*
" " *lutea.*
" *ruthenica.*
" *sibirica.*
" " *alba.*
" " *haematophylla.*
" " *violacea.*
" *squalens.*
" " Bronze Stoffels.
" " Dina.
" " Hector.
" " La Marmora.
" " La Tristesse.
" " Minerve.
" " Tarquin.
" *variegata.*
" " Arquinto.
" " Coquette.
" " Darius.
" " Gracchus.
" " Henry Havard.
" " Honorabile.
" " Innocenza.
" " Pancrace.
" " Samson.
" " Souvenir.
" " Minos.
" *virescens.*

PERENNIAL PHLOX.

In May, 1900, 23 varieties were received from the Central Experimental Farm, and planted. The following lived through the winter but made very little progress this year :

Phlox decussata Sorpillum.

Phlox decussata, New Dwarf White.

Phlox reptans.

PAEONIES.

Of the 33 varieties received from the Central Experimental Farm, and planted in May, 1900, 17 died during the summer of that year or the winter of 1900-01.

The following varieties came through the winter in good condition and formed a very attractive bed during the season. Some of the white varieties were very fine.

Paeonia sinensis, Thorbecki.
„ „ Souvenir de l'Exp. Universelle.
„ „ Mons. de Villeneuve.
„ „ Albiflora Thorbecki.
„ „ Officinalis Mutabilis.
„ „ Professor Morren.
„ „ Festiva Maxima.
„ „ De Candolle.
Paeonia sinensis, Mutabilis.
„ „ rubicunda albo marg.
„ „ rubra plenissima.
„ „ Festiva.
„ „ Duchess d'Orleans.
„ „ Ambroise Verschaffelt.
„ „ Prosper d'Aremberg.
„ „ L'Eclatante.

HERBACEOUS SPIREAS.

Twelve varieties were planted in the spring of 1900, but not a single plant lived through the winter.

OTHER PERENNIALS.

A fair proportion of the large list of sundry Perennials received last year from the Experimental Farm, Ottawa, came through the winter in good condition and bloomed this year. Following is a list of the varieties living at the end of this season :—

Achillea millefolium rubrum.
„ Sibirica Blush.
„ „ White.
„ Ptarmica fl. pl.
Acorus spurius.
Asarum Canadense.
Ajuga reptans atropurpurea.
„ Genevensis.
Aster Noviæ Angliæ roseus.
„ „ Newry seedling.
„ „ Top Sawyer.
„ „ W. Bowman.
„ „ White Queen.
Asclepias tuberosa.
Artemisia stellarianum.
Boltonia latisquama.
„ asteroides.
Chelone barbata.
Clematis recta.
Coreopsis delphinifolia.
Centaurea montana alba.
„ macrocephala.
Campanula Rainerii.
Doronicum Clusii.
Erigeron macranthus.
Funkia lancifolia.
„ Sieboldiana.
Geranium maculatum.
Helenium grandiflorum.
Heuchera sanguinea.
Hemerocallis Dumortieri.
„ fulva.
„ Kwanso fl. pl.
„ variegata fl. pl.
„ Midendorfii.
„ disticha fl. pl.
„ graminifolia.
Helianthus Maximiliana.
„ giganteus.
„ autumnale.
Lupinus polyphyllus.
Lilium superbum.
Lysimachia nummularifolia.
„ punctata.
„ clethroides.
Poterium officinale.
Pyrethrum uliginosum.
Phalaris arundinacea fol. var.
Physostegia Virginica alba.
Rudbeckia laciniata.
Sempervivum Boulicianum.
Symphitum asperrimum.
Sidalcea candida.
Solidago gigantea.
„ rigida.
Thermopsis fabacea.
„ Caroliniana.
Veronica spicata.
„ Virginica.
„ elegans carnea.

TREES AND SHRUBS.

The trees and shrubs on the Farm have never been in a more healthy and vigorous condition than during the past season. There being no spring winds or frosts to injure even the most tender varieties ; all made a rapid and strong growth from the start. Every tree and bush on the Farm was in full leaf on May 24.

The growth during the season was remarkable in all species and varieties. Maple trees and hedges, willow hedges and elm trees made from 4 to 6 feet, and all new wood was well ripened before winter set in.

Unfortunately, in September, a very heavy storm of wet snow broke down a good many varieties of trees and shrubs and was particularly severe on the hedges, several of which were flattened to the ground. As far as possible the snow was shaken off by hand, but with the miles of avenues and hedges on the Farm, the extent to which this work could be carried on was comparatively small.

Of the shrubs, the Siberian pea-tree, lilacs, honeysuckles and spireas did particularly well. The lilacs were a mass of bloom beginning May 19 and made by far the best showing we have ever had. The same, in fact, was the case with all shrubs, but the lilacs so much surpassed any former year, that they were very noticeable.

Like the trees, all varieties of shrubs thoroughly matured their wood and are in good condition to stand the winter.

The distribution of trees, tree seeds, shrubs and shrub seed was larger than usual last spring, but the demand was very largely in excess of the supply available for that purpose.

A fungus destroyed the maple seed throughout the greater part of Assiniboia, this year, and the seed for distribution had to be obtained from Manitoba. The trees on the Farm bore more than sufficient seed to supply all applicants, but it was rendered useless by this fungus. Ash, elm and caragana seed was abundant and good, and a sufficient supply has been secured.

THE DISTRIBUTION OF SEEDLING TREES BY THE FORESTRY BRANCH OF THE DEPARTMENT OF THE INTERIOR.

The Department of the Interior, Ottawa, having decided to grow trees for distribution among the settlers of the North-west Territories, fifteen acres of land on the Experimental Farm was granted by the Department of Agriculture for the use of the Forestry Branch, under Mr. E. Stewart, superintendent, for the purpose of raising seedling trees.

This land was in good condition ; but when the maple seed was sown, a very dry spell set in and only a small proportion of the seed germinated. In addition to the maple, seed of elm, birch, ash and caragana arborescens was sown, and cuttings of poplar and willow planted.

A great many thousand trees will be available for distribution next spring, and by the spring of 1903, with the additional land taken, there should be many hundreds of thousands ready for the same purpose.

In the past twelve years the demand for trees and shrubs from the Experimental Farm has been far greater than the supply ; and it will tax the resources of the Forestry Branch to meet the demands, which are steadily on the increase, for trees for the southern portion of the Territories.

It is not intended to curtail the extent of the Experimental Farm distribution, and from the number of applications already received, more material than ever will be required for the coming spring ; but the Experimental Farms have received instructions to render the Forestry Branch every assistance in the good work they have undertaken.

ARBORETUM.

The Arboretum made good progress during the season, and as many of the species and varieties are now flowering and fruiting, it is becoming one of the most attractive spots on the Farm.

Following will be found a list of the species and varieties at present under test, with date planted, and notes as to hardiness. Those which have come through one or more winters without injury, or with very slight injury to the tips only, have been marked 'hardy' ; where the new wood has been killed back to one-half its growth, such

are said to be 'half hardy,' and those which have had their wood killed by winter, to the ground, have been noted as 'tender.' The list also includes a number of varieties which were received and planted last spring. Of course no opinion can be expressed at present as to the hardiness of these.

Name.	Common Name.	Planted.	Remarks.
Acanthopanax sessiliflorum		1900	Nearly hardy.
Acer dasycarpum	White maple	1896	Half hardy.
" Negundo	Box-elder	1895	Hardy.
" platanoides	Norway maple	1896	Half hardy.
" saccharinum	Rock or Sugar maple	1899	"
" " Minnesota seed No. 1		1897	Nearly hardy.
" tataricum Ginnala	Ginnalian maple	1895	Hardy.
Alnus glutinosa	Common alder	1896	Half hardy.
" " imperialis	Imperial cut-leaved alder	1899	Tender.
" viridis	Green alder	1896	"
Amelanchier alnifolia	Alder-leaved June-berry	1895	Hardy.
Amorpha canescens	Lead plant	1900	Half hardy.
Artemisia Abrotanum	Old man	1895	"
" " tobolskianum		1895	"
Berberis amurensis	Amur Barberry	1899	Hardy.
" aristata		1896	Half hardy.
" cerasina		1896	Hardy.
" cretica	Cretan Barberry	1899	Nearly hardy.
" Fischeri		1896	Half hardy.
" ilicifolia	Holly-leaved Barberry	1896	Tender.
" Sieboldii	Siebold's "	1898	Half hardy.
" sinensis	Chinese "	1896	"
" Thunbergi		1897	"
" Hybrid No. 2		1899	Nearly hardy.
" vulgaris iberica		1899	"
" " japonica		1899	Half hardy.
" " foliis purpureis		1896	Tender.
" " violacea		1897	Nearly hardy.
Betula alba	European White Birch	1895	Hardy.
" " fastigiata	Pyramidal Birch	1899	Tender.
" " laciniata pendula	Cut-leaved "	1899	"
" " pendula Youngii	Young's Weeping Birch	1900	Half hardy.
" davurica		1896	Hardy.
" (from Niemetz)		1898	Half hardy.
" lenta	Sweet Birch	1899	Nearly hardy.
" papyrifera	Paper "	1896	"
" populifolia	White "	1899	"
" pumila	Low "	1899	Hardy.
Caragana arborescens	Siberian Pea-tree	1895	"
" Chamlagu		1900	"
" frutescens	Woody caragana	1895	"
" " mollis glabra		1896	"
" grandiflora	Large-flowered caragana	1896	"
" microphylla		1901	
" pygmaea	Dwarf caragana	1896	"
" " aurantiaca		1900	"
Celastrus scandens	Climbing Bitter-sweet	1898	Half hardy.
Celtis occidentalis	Hack-berry	1901	
Clematis flammula	Sweet-scented Virgin's bower	1898	Half hardy.
" lignsticifolia		1898	Hardy.
" vitalba	Common traveller's joy	1898	Half hardy.
" viticella		1901	
Cornus alba Sibirica	Siberian Dogwood	1897	Hardy.
" " variegata	Variegated "	1897	Nearly hardy.
" amomum		1897	Tender.
" Baileyi		1899	Hardy.
" sanguinea		1897	Half hardy.
" Spathii Golden		1899	Tender.
" stolonifera		1896	Hardy.
Cotoneaster acutifolia		1899	"
" integerrima	Common Cotoneaster	1896	"
" laxiflora		1899	"
" No. 10 (Niemetz)		1898	"

Name.	Common Name.	Planted.	Remarks.
Crataegus chlorosarca		1896	Hardy.
" coccinea	Scarlet Haw	1896	"
" Crusgalli	Cockspur thorn	1896	"
" nigra		1900	"
" Oxyacantha sibirica		1897	"
" No. 9 (Niemetz)		1898	"
" sanguinea		1897	"
Cytisus biflorus		1899	Tender.
" capitatus		1899	Hardy.
" nigricans		1899	Half hardy.
" " longispicatus		1898	Tender.
" sessilifolius		1896	Half hardy.
Elaeagnus angustifolia	Russian Olive	1895	Hardy.
" argentea	Wolf willow	1895	"
Euonymus atropurpureus	Burning bush	1896	Half hardy.
" europeus	Common spindle-tree	1896	"
" obovata		1899	Tender.
Fraxinus americana	White ash	1896	Nearly hardy.
" berlanderiana	Berlander ash	1897	Tender.
" nigra	Black ash	1899	Hardy.
" pennsylvanica	Red ash	1895	"
" " lanceolata	Green ash	1899	"
" quadrangulata	Blue ash	1897	Tender.
Genista tinctoria Sibirica		1899	"
Gleditschia triacanthos inermis		1900	"
Gymnocladus canadensis	Kentucky Coffee-tree	1898	"
Hippophae rhamnoides	Sea-buckthorn	1901	
Hydrangea paniculata, grandiflora		1896	Tender.
Laburnum alpinum		1899	"
Ligustrum amurensis	Amur privet	1899	Half hardy.
" vulgaris fol. aureis variegatis		1899	Tender.
Lonicera Alberti	Albert Regel's Honeysuckle	1896	Hardy.
" glauca	Glaucous-leaved	1899	"
" gracilipes		1898	"
" hirsutus	Hairy Honeysuckle	1899	"
" Periclymenum	Woodbine	1901	
" punicea		1899	Tender.
" ruprechtiana		1901	-
" Sullivantii		1901	
" tatarica	Tartarian honeysuckle	1896	Hardy.
" Xylosteum		1899	"
Memispermum dauricum		1900	Tender.
Neillia opulifolia	Ninebark	1900	Hardy.
Ostrya virginica	Ironwood	1899	Hardy.
Philadelphus deutziaeflorus		1896	Half hardy.
" grandiflorus	Large flowered Syringa	1896	"
" hybridus Lem Boule d'Argent		1899	Tender.
" Keteleerii flore pleno		1900	"
Photinia variabilis arguta		1899	"
Pyrus aria flabelliformis		1897	Hardy.
" baccata	Siberian crab	1896	"
" rotundifolia		1900	Tender.
" americana	American Mountain ash	1896	Hardy.
" aucuparia	European " "	1896	Half hardy.
" Maulei	Maule's Japanese Quince	1899	"
Prunus Maximowiczii		1899	Hardy.
" pennsylvanica	Wild Red cherry	1895	"
" pumila		1895	"
" demissa	Western wild cherry	1895	"
" grayana		1896	"
" Maackii		1896	"
" serotina	Wild Black cherry	1899	Half hardy.
Populus alba nivea		1896	Hardy.
" " pyramidalis	Pyramidal Silver poplar	1896	Nearly hardy.
" balsamifera	Balsam poplar	1895	Hardy.
" berolinensis		1895	"
" certinensis		1896	"
" deltoidea	Cotton-wood	1895	"
" " aurea	Golden-leaved poplar	1901	
" nigra	Black poplar	1898	"
" " betulaefolia		1896	"

Name.	Common Name.	Planted	Remarks.
Populus nigra Nolesti		1896	Hardy.
" petrowskyana		1896	"
" suaveolens		1898	"
" tremuloides	American aspen	1895	"
" Wobstii		1896	"
Potentilla fruticosa	Shrubby Cinque-foil	1899	"
Quercus coccinea	Scarlet Oak	1899	Half hardy.
" macrocarpa	Mossy-cup Oak	1895	Hardy.
Rhamnus cathartica	Common Buck-thorn	1896	"
" crenata		1900	Tender.
" davurica		1899	Hardy.
" Frangula		1896	"
" No. 13 (Niemetz)		1898	"
Rhus glabra	Smooth Sumach	1896	Nearly hardy.
Ribes alpinum	Mountain Currant	1899	Tender.
" " pumilum		1899	Hardy.
" aureum	Missouri Currant	1899	"
" " tenuiflorum		1901	
" cereum	White-flowered Currant	1899	"
" gordonianum		1899	Tender.
" robustum		1899	"
" (from Cypress Hills)		1900	Hardy.
" Sibirica		1898	"
Rosa blanda	Smooth Rose	1898	"
" californica		1899	Half hardy.
" ferruginea	Purple leaved Rose	1895	Hardy.
" rugosa	Japanese Rose	1896	"
" villosa pomifera		1898	Nearly hardy.
Rubus balfouriana		1900	Hardy.
" caesius		1900	"
Sambucus canadensis	Common Alder	1896	Nearly hardy.
" nigra aurea nova		1896	Tender.
" " foliis aureis		1896	"
" " heterophylla		1896	"
" " Swindonensis		1899	"
" No. 45 (Niemetz)		1898	"
" (Blue-fruited from B.C.)		1899	"
" nigra virescens		1899	"
Shepherdia argentea	Buffalo Berry	1895	Hardy.
Salix alba argentea	Silver leaved Willow	1897	Half hardy.
" " britzensis		1896	Hardy.
" aurea pendula		1896	Nearly hardy.
" Bataviæ		1898	"
" Caprea	Goat Willow	1897	Half hardy.
" daphnoides	Violet Willow	1895	Hardy.
" longifolia argyrophylla		1898	Half hardy.
" Nicholsoni purpurescens		1898	Nearly hardy.
" nigricans	Dark broad leaved Willow	1898	"
" pentandra	Laurel leaved Willow	1896	Hardy.
" purpurea pendula		1896	"
" rubra forbyana		1896	Half hardy.
" Salamoni		1898	"
" triandra		1897	Hardy.
" Voronesh	Voronesh Willow	1895	"
Spiræa arguta		1896	"
" chamaedrifolia		1896	"
" discolor	White-beam leaved Spiraea	1899	Half hardy.
" japonica	Japanese Spiraea	1899	Tender.
" " alba	White Japanese Spiraea	1899	Half hardy.
" " Bumalda		1899	Tender.
" " superba		1896	"
" media		1899	"
" salicifolia	Common Meadow-sweet	1899	Hardy.
" sorbifolia	Sorbus leaved Spiraea	1898	Half Hardy.
" tomentosa	Hard-hack	1898	Tender.
" Van Houttei		1895	Half hardy.
Symphoricarpus Heyeri		1900	Tender.
" racemosus	Snow-berry	1895	Hardy.
Syringa chinensis	Rouen Lilac	1896	Hardy.
" Josikea	Josika's Lilac	1895	Nearly hardy.
" pekinensis	Pekin Lilac	1899	Half hardy.

Name.	Common Name.	Planted	Remarks.
Syringa villosa		1895	Hardy.
" vulgaris	Common Lilac	1895	"
" " Abel Carrière		1901	
" " Alba	White Lilac	1899	Hardy.
" " " Grandiflora		1899	"
" " Alphonse Lavallee		1901	
" " Charles Joly		1901	
" " Charles X		1899	Hardy.
" " Condorcet		1901	
" " Congo		1901	
" " Emilie Lemoine		1901	
" " Francisque Morel		1901	
" " Jean Bart		1901	
" " La Tour d'Auvergne		1901	
" " Lemoinii		1901	
" " Mad. Casimir Perier		1901	
" " Mad. Lemoine		1901	
" " Marie Legraye		1901	
" " Mathieu de Dombasle		1901	
" " Michel Buchner		1901	
" " President Grevy		1901	
" " Maxime Cornu		1901	
" " purpurea		1896	Hardy.
" " Virginite		1901	
Tilia americana	Basswood	1896	Half hardy.
Ulmus americana	American Elm	1895	Hardy.
Viburnum Lantana	Wayfaring tree	1898	Half hardy.
" Opulus	High-bush Cranberry	1895	Hardy.
" " sterile	Snow-ball	1898	Half hardy.
" prunifolium	Black haw	1899	Hardy.
Coniferæ.			
Abies balsamea	Balsam Fir	1896	Hardy.
" " variegata	Variegated Fir	1900	Tender.
" lasiocarpa		1898	Half hardy.
Juniperus communis	Common Juniper	1901	
" Sabina	Common Savin	1901	
" " variegata	Variegated Savin	1901	
" virginiana elegans variegata		1899	Hardy.
" " glauca		1899	Half hardy.
" " Schotti		1899	Hardy.
" " tripartita		1899	Tender.
Larix europea	European Larch	1899	Nearly hardy.
" pendula	American Larch	1896	Hardy.
Pseudotsuga Douglasii	Douglas Spruce	1895	Nearly hardy.
Picea alba	White Spruce	1895	Hardy.
" " coerulea		1901	
" " variegata		1899	Hardy.
" alcockiana	Alcock's Spruce	1898	Tender.
" excelsa	Norway Spruce	1895	Nearly hardy.
" " pendula major		1899	Tender.
" " pyramidalis	Pyramidal Norway Spruce	1899	Nearly hardy.
" nigra	Black Spruce	1901	
" obovata schrenkiana		1899	Hardy.
" pungens	Rocky Mountain Spruce	1895	"
" " glauca		1899	"
Pinus Cembra	Stone Pine	1895	"
" Laricio nigricans	Austrian Pine	1899	Tender.
" montana	Mountain Pine	1895	Nearly hardy.
" " Mughus	Dwarf Mountain Pine	1899	Half hardy.
" sylvestris	Scotch Pine	1895	Nearly hardy.
Thuya occidentalis	White Cedar	1895	"
" " Hoveii	Hovey's Arbor-vitæ	1900	Half hardy.
" " Meehani	Meehan's Arbor-vitæ	1900	Tender.
" " Columbiae		1899	Nearly hardy.
" " Wareana	Ware's Arbor-vitæ	1899	"

Sample Hedges.

The sample hedges did well this year. The following varieties have been added to the last list :—

Celtis Occidentalis, Cornus Stolonifera, Abies Balsamea, Picea Nigra, Juniperus Communis, Picea Coerulea.

FRUIT TREES AND BUSHES.

The season was most favourable for fruits of all kinds with the exception of black currants and strawberries, and the crops of crab apples and plums were the best ever produced on the Farm.

Nearly all varieties came through the winter in good condition and blossomed freely. Warm weather with a sufficient amount of rain, rushed the fruit forward and with the exception of a few varieties of late plums, everything had matured before the frost of September 17, which was hard enough to ruin all unpicked fruit.

No damage was occasioned by insects, except in the case of plum trees which were attacked by an Aphis in July. The trees were sprayed twice with kerosene emulsion, and so far as could be observed, did not sustain much injury from the attack.

SEEDLING APPLES.

The two seedlings each of Tonka and Arctic, planted in the spring of 1899, have continued to do well. The trees were alive at the tips this spring and made strong growth during the season.

In 1900, six trees each of Wealthy, Blushed Calville and Hibernal, received from Mr. A. P. Stevenson, Nelson, Manitoba, were planted. Four Wealthy and two Blushed Calville lived through the winter and made fair progress this season.

GRAFTING.

Last spring scions of hardy apples and crab apples were received from Mr. A. P. Stevenson, Nelson, Manitoba, and top-grafted on the Pyrus Baccata and Pyrus Prunifolia which were planted in 1896, and have been fruiting for two or three years.

Thirteen trees were top-worked by Mr. Geo. Lang, with from 4 to 10 scions each. The following grafts struck and made strong growth during the season :—

Two Hibernal on Pyrus Baccata Macrocarpa.
One Antonovka on Pyrus Prunifolia.
Three Anisette on Pyrus Prunifolia.
One Lieby on Pyrus Baccata Cerasiformus.
Two Transcendent on Pyrus Baccata Macrocarpa.

FRUITING.

CRAB APPLES (*Pyrus Baccata*).

Planted 1896.

The trees wintered well and by May 18 were a mass of bloom. A strong, healthy growth has been made during the season and the wood ripened fairly well before winter set in. The heavy snow storm on September 23, 1901, did con-

siderable damage to the limbs and branches, but on account of the upright character of most of the trees the breakage was not so severe as to cause permanent injury.

The varieties have all grown well and continue to be perfectly hardy. The notes following are confined to fruiting.

To test the fruit a considerable quantity was made into jelly and pickles, and for either of these commodities nothing better could be desired. The astringency of the fruit disappears in the jelly, and the acidity can be overcome by the addition of sugar.

INDIAN HEAD SEEDLINGS.

Pyrus baccata genuina—

Three trees fruited ; ripe September 10 ; fruit about size of Baccata.* Colour yellow with red cheek ; rather acid and slightly astringent.

Pyrus baccata cerasiformis—

Ten trees fruited ; ripe September 5 to 10 ; fruit larger than Baccata ; crop, heavy ; generally acid and astringent.

Pyrus baccata macrocarpa—

Seventeen trees fruited ; ripe September 5 ; fruit generally considerably larger than baccata and the best grown this year. Notes taken on one of the best of these read as follows :—

Row 4, No. 4.—Fruited lightly ; fruit one inch in diameter ; colour, red, streaked ; flat ; Calyx persistent ; flesh juicy and very slightly astringent ; excellent quality. The best crab apple grown this year.

Pyrus baccata sanguinea—

Four trees fruited ; ripe September 1 to 5 ; early ; generally smaller than baccata ; slightly acid and moderately astringent ; flavour good but fruit small.

Pyrus prunifolia—

Eleven trees fruited; ripe September 5 to 10; generally about the size of baccata, juicy, acid and astringent.

SEEDLINGS RECEIVED FROM CENTRAL EXPERIMENTAL FARM, OTTAWA.

Pyrus baccata sanguinea—

Three trees fruited ; ripe September 12 ; considerably larger than baccata ; juicy, slightly bitter and moderately astringent.

Pyrus baccata aurantiaca—

One tree fruited ; size of baccata ; red, slightly bitter and astringent, but juicy and of better flavour than the average.

Pyrus baccata macrocarpa—

One tree fruited ; ripe September 18 ; larger than baccata ; light crop ; yellow with red cheek, juicy, acid and astringent.

Pyrus prunifolia intermedia—

One tree fruited ; ripe September 11 ; a little larger than baccata ; light crop; red juicy, acid and slightly astringent.

---

*The ordinary form of P. baccata has fruit about the size of a large cultivated cherry.

Pyrus baccata cerasiformis—

Four trees fruited ; ripe September 10 to 20 ; generally about the size of baccata ; rather flat in form ; juicy, red, astringent ; medium crop.

Pyrus baccata genuina—

Five trees fruited ; ripe September 5 to 10 ; fruit generally smaller than baccata ; juicy, slightly acid and very astringent.

HYBRID CRABS.

(Planted spring of 1898 and 1899).

Were transplanted in 1900 to a new location. The transplanting was fatal to many of them.

This spring two trees of cross-bred seedling No. 96 ; 5 trees of No. 95 ; 1 tree of No. 51 ; and 1 tree of No. 529 were alive.

Of the six each of the five varieties of hybrid crabs produced at the Central Experimental Farm, sent as root grafts, and planted in the spring of 1900, only 1 Progress, 4 Charles, 1 Prairie Gem, and 1 Novelty, survived.

These trees are now, however, well established, and will probably make rapid progress next season.

A large number of cross-breds, seedlings of cross-breds, with other seedling Pyrus trees were received from the Central Experimental Farm last spring. Some of these were planted in a new orchard and others were put temporarily in nursery rows to be planted out later.

NEW PYRUS ORCHARD.

A new Pyrus orchard was commenced this year, south of the Superintendent's house, in a plot well sheltered on all sides by hedges, in which the following were set :—

SEEDLINGS.

Two No. 171 ; 3 No. 167 ; 1 No. 198 ; 1 No. 162 ; 1 No. 30 ; 1 No. 107 ; 4 No. 165 ; 1 No. 142 ; 1 No. 161 ; 1 No. 192 ; 1 No. 184 ; 1 No. 183 ; 2 No. 196 ; 4 No. 175 ; 4 No. 520 ; 1 No. 19 ; 2 No. 142 ; 1 No. 79 ; 1 No. 12 ; 1 No. 45 ; 2 No. 116 ; 1 No. 132 ; 1 Eastman ; 1 Aurora ; 2 Cavan ; 2 Belmont ; 6 Rupert ; 4 Hunter, and 1 Carleton.

The following were also set out to the south of the old Pyrus orchard. Unless otherwise marked, all there were sent from the Central Experimental Farm :—

4 seedlings of *Pyrus baccata edulis*.
3 *Pyrus baccata* x Krimskoe.
4 " x Ball's winter crab.
2 " x Pewaukee.
4 seedlings of Hunter.
10 " Progress.
6 " Hyslop Crab. (From Stevenson.)
2 " Sweet Russet Hybrid. (From Stevenson).
7 " Eastman.
8 " Pauline.
9 " Charles.
4 " Belmont.
12 " Prairie Gem.
12 " Dean.
6 " Transcendent Crab. (From Stevenson).
1 " Virginia Crab. "
5 " Minnesota Hybrid. "
6 " Novelty.
4 " Eaton.
8 " Cavan.
4 Rupert hybrid sand cherry.

5 Row 13, No. 1.
6 Seedlings of Aurora.
6 Row 6, No. 1.
4 *Pyrus prunifolia fructu coccinea*.
4 *Pyrus Sieboldii*. (1850).
4 *Pyrus Malus, A. A.*
5 seedlings of *Pyrus Malus pendula, A. A.*
3 " Philip's sweet crab. (Stevenson).
4 *Pyrus betulæfolia*.
4 " *baccata, A. A.*, 139.
4 " " *orthocarpa*.
4 " " *var*.
4 " " *oblonga, A. A.*
4 " " late keeping variety.
4 " " (2550).
4 " " *flava*.
4 " " *spectabilis floridus*.
4 " " *sanguinea*.
4 " " *spectabilis var*, 1615.
4 " " " *A. A.*
5 " *prunifolia, var*, 139.

Most of these are doing well.

PLUMS.

The crop of plums was the heaviest so far grown on the Farm. In many cases the branches had to be propped up to prevent breaking from the weight of fruit, and in some instances even this did not save them.

Sixty per cent of the fruit ripened before frost came. The Aikin plum which was so early in 1900, was again the first to ripen ; but did not prove to be of first-class quality, the fruit being soft and rather tasteless.

Seedlings of Hungarian—Planted 1894.—Came through the winter in good condition. Eleven trees blossomed for the first time, May 19, and set a heavy crop of fruit. Only three trees ripened before the heavy frost on September 17, and it is feared that these are too late to be valuable for the Territories.

Notes.—Row 2, No. 6—Ripe September 15 ; medium crop ; small, yellow, acid.

Row 4, No. 4—Ripe September 13 ; light crop ; medium size ; yellow, of good flavour, but coarse in texture.

Row 4, No. 5—Ripe September 15 ; a light crop ; size, medium ; yellow ; of excellent flavour and texture.

Seedling of Speer—Planted 1895.—Wintered in good condition. Blossomed lightly on May 17, and fruited lightly for the first time. There was no fruit ripe on this tree on September 17.

Seedling of De Soto—Planted 1895.—This wintered in good condition, and blossomed and fruited heavily. The fruit was of good quality and flavour. Ripe September 13.

Seedlings of Weaver—Planted 1894.—Wintered in good condition and came in bloom May 20. Fifty-one trees fruited, and on the whole the crop was an excellent one. The fruit was generally a little later in ripening than the Manitoba Native Plums, but that on 27 trees was ripe and pulled before the frost came on September 17; on twelve others nearly ripe and picked on the 16th ; consequently there was a large proportion of the fruit secured in good condition.

About 25 per cent of the trees produced fruit of good size and excellent quality and flavour. Fifty per cent were of medium size, generally thicker in the skin, but of good flavour and texture ; and the balance were small and of poorer quality, although there were exceptions in all the cases.

The following notes on individual trees are chosen as being fairly representative of the three classes:—

Large Sized Sorts.

Row 1, No. 4.—Ripe September 10. A heavy crop of large, fine fruit ; yellow sweet, juicy, with a thin skin.

Row 1, No. 16.—Ripe September 12. A heavy crop, large, pear-shaped, yellow, red on the sunny side, juicy, and of very fine flavour and texture. Skin, medium. Probably the best plum grown on the Farm this year.

Medium Sized Sorts.

Row 4, No. 15.—Ripe September 15. A heavy crop of medium sized fruit, yellow, juicy, slightly acid, but of good quality ; skin medium.

Row 2, No. 6.—Ripe September 17. A medium crop ; fruit of medium size, yellow and red, juicy, good flavour, sweet ; skin of medium thickness.

Small Varieties.

Row 2, No. 17.—Ripe September 15. A medium crop ; fruit of small size, yellow, and of fair flavour and texture ; thick skin and very small stone.

Aikin Plum.—Planted 1897.—Wintered in good condition. Blossomed May 15. Ripe September 1.

Considering the size of the tree, the crop was a heavy one, and it attracted a great deal of attention during the latter part of the season. Although the Aikin may not be of quite as fine flavour as some of the Weaver seedlings, it is as large and ripens a few days earlier, which would be very much in its favour in a short season.

This variety is undoubtedly a valuable one for the Territories ; and all the pits have been preserved for planting.

Rollingston seedling—Planted 1897.—Blossomed lightly May 17.Produced a light crop of small, red fruit, which did not ripen before frost.

MANITOBA NATIVE PLUMS.

(From Thos. Frankland, Stonewall, Manitoba.)

Wintered in good condition and came in bloom May 17. Crop good.

A considerable quantity of the crop of fruit ripened this year was sold for preserving or canning and samples were sent to different parts of the Territories.

It is gratifying to know that some of the seedling plums distributed to settlers during the past six years are now bearing fruit ; several samples having been, very kindly, sent in by the growers.

PLUM TREES RECEIVED FROM CHAS. LUEDLOFF, COLOGNE, MINN., U.S.A.

Planted 1896.—Came through the winter in good condition and blossomed on May 20.

Name.	Crop.	Size.	Colour.	Texture.	Flavour.	Date ripe.
Charles Downing	Light	Large	Yellow	Coarse	Excellent	Sept. 6
Reed	Heavy	"	"	Good	Good	" 6
City	Medium	Medium	"	"	"	" 8
Caylord	Heavy	"	Red	"	Excellent	" 10
Crescent City	"	Large	Yellow	Coarse	Good	" 10
Weaver	"	Medium	"	"	Medium	" 10
New Ulm	Light	Large	"	Good	Excellent	" 10
Van Deman	Medium	Medium	"	"	Good	" 10
Milton	Heavy	Small	"	Medium	Excellent	" 10
Anthony	Light	"	Red	...	...	Frozen.
Irene	"	"	Yellow	...	...	"
Deep Creek	Heavy	Medium	"	...	...	"
"	"	"	"	Coarse	Medium	Sept. 13
Purple Yosemite	Medium	"	"	...	...	Frozen
Cottrell	Heavy	"	"	Good	Excellent	Sept. 14
"	Light	Large	"	"	"	" 15
Weaver	Medium	"	"	"	Good	" 13
Van Buren	Light	Small	"	...	...	Frozen
Newman	Heavy	Medium	...	...	...	"
Dr. Dennis	Light	Large	...	...	...	"
Yellow Sweet	"	"	Yellow	Good	Good	Sept. 16
Ocheeda	Heavy	"	"	"	Excellent	" 13
Col. Wilder	Light	Small	Red	"	"	" 13
American Eagle	Heavy	Medium	"	"	Good	" 15
De Soto	Medium	Large	Yellow	"	Excellent	" 15
Crescent City	Heavy	"	"	"	"	" 13
Neil's	"	Small	"	"	...	Frozen.
Wood	Light	"	"	...	...	"
Dunlap No. 1	Heavy	Medium	"	Medium	...	"
Peffer's Premium	"	Small	"	...	...	"
Large Red Sweet	"	"	Red	Good	Excellent	Sept. 13
Hammer	Light	Medium	Yellow	...	...	Frozen.
"	Medium	"	"	Medium	Medium	Sept. 15
Silas Wilson	Light	Large	"	...	...	Frozen.
City	Heavy	Small	Red	Medium	Good	Sept. 13
Richland	"	Medium	Yellow	Coarse	Medium	" 15

CHERRIES.

Seedling of Carnation —Planted 1894.—Wintered in good condition. Made strong growth, but did not fruit.

Seedling of Lithaur Weichsel—Planted 1894.—Wintered in good condition. Made strong growth during the season, but did not fruit.

Seedling of Olivet —Planted 1895.—One tree winter-killed to ground and was taken up and destroyed; the other came out in good condition and made fair growth.

Mahaleb.—Planted 1895.—One tree was killed slightly at tips; the other wintered in good condition. Did not blossom.

Seedling of Wild Cherry from Nebraska.—Planted 1896.—Apparently now quite hardy. Blossomed and fruited lightly. Fruit like Prunus Demissa, but larger.

Rocky Mountain Cherry.—Planted 1895.—Hardy. Fruited heavily, but fruit is small and too late.

Prunus Pumila.—Hardy. Medium crop of fairly good fruit.

SMALL FRUITS.

The crop of small fruits, with the exception of Black Currants and Strawberries, was above the average; and some excellent fruit was secured.

Rust struck the currants, but as the fruit was well formed, little or no damage was done.

WHITE CURRANTS.

White Grape, White Dutch, White Transparent and White Imperial were under test. All were hardy, made strong growth and produced excellent crops of fruit.

RED CURRANTS.

Fay's Prolific, Raby Castle, Red Dutch, La Conde, Knight's Early Red, New Red Dutch, Native Red, London Red, Victoria, Fertile d'Angers, Cherry, Prince Albert, La Fertile, Versailles, North Star, Pomona and Wilder, under test. Came through the winter in good condition. A large crop of fruit set, which ripened rather unevenly, but on the whole the crop was above the average.

BLACK CURRANTS.

Lee's Prolific, Black Naples, Prince of Wales, Crandall, and the following of Saunders' Seedlings, Stewart, Orton, Clipper, Kerry, Eagle, Monarch, Charmer, Beauty, Winona, Ontario, Standard, Lewis, Ethel, Stirling, Star, Madoc, Perry, Eclipse, Oxford, Climax, all wintered in good condition and made very strong growth. A very light crop of fruit set, but any that matured was of superior size and quality.

RASPBERRIES.

Dr. Reider, Philadelphia, Turner, Caroline, Lady Anne, Garfield, Miller's Red and Kenyon came out of winter covering in good condition and blossomed very freely. The crop was fair. The fruit of Dr. Reider, Miller's Red and Philadelphia was very large and of excellent quality.

GOOSEBERRIES.

Smith's Improved, Lancashire Lad, Governess, Columbus, Houghton, Native, Pearl and Keepsake, under test. All are quite hardy. Made strong growth and produced a medium crop, giving fruit of good size and quality.

STRAWBERRIES.

Capt. Jack, New Dominion, Windsor Chief and Pineapple, under test. On account of the very dry weather during the first two weeks in June, the crop was almost a total failure. Fruit small and inferior.

SUMMER-FALLOWS.

It is very gratifying to know that throughout the Territories, summer-fallowing is rapidly becoming general. No matter where farming is carried on, the farmers realize that to be sure of a crop they must prepare a portion of their land the year before the crop is grown, and apart from the value of the stored moisture, there is the inestimable advantage of keeping weeds from over-running the farm.

The true worth of properly prepared fallows was clearly demonstrated in the season of 1900 in every grain-growing district of Assiniboia, and although the season just past has been an extraordinary one, the crops grown on fallows were, in every case, the heaviest producers.

The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Territories, that perhaps a few words on one of the methods employed may be of help to at least some of the new settlers.

It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full-grown and in many cases, bearing fully matured seed. It is then ploughed.

By this method, which, no doubt, saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved because the land has been pumped dry by the heavy growth of weeds; and, secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and while no weed is more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or of fall or spring cultivation.

As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

First Method.—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

Result.—Too much late growth if season was at all wet; grain late in ripening, and a large crop of weeds if the grain was in any way injured by winds.

Second Method.—Ploughed shallow (3 inches deep)) before the last of June ; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

Result.—Poor crop in a dry year ; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

Third Method.—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

Result.—Soil too loose and does not retain moisture. Crop light and weedy in a dry year.

Fourth Method.—Ploughed deep (7 to 8 inches) before the last of June ; surface cultivated during the growing season.

Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years, the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therefore recommended.

Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results ; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughed under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.

BREAKING AND BACK-SETTING.

In view of the fact that every year brings to the Territories, many new settlers who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

In all sections where the sod is thick and tough, breaking and back-setting should be done ; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

The former is generally applicable to Assiniboia, and the latter to Alberta and Saskatchewan, especially to the northern parts of these Territories where the land is more or less scrubby.

SHALLOW BREAKING.

(To be back-set).

The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14 inch share, is the best. When the breaking is completed (which should not be later than the second week in July), rolling will hasten the rotting process and permit back-setting to commence early in August.

BACK-SETTING.

Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough but three or four inches will give better results.

After back-setting, the soil cannot be made too fine and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

DEEP BREAKING.

Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where

breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deep as possible ; usually from 4 to 5 inches.

When the sod has rotted, the top-soil should be worked and made as fine as possible. The use of harrow or disc will fill up all irregularities on the surface, and make a fine, even seed bed.

Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

To some districts near the foot-hills of the mountains and in districts where scrub abounds, and the sod is thin, these remarks may not apply, but, as a rule, throughout the Territories, early breaking, whether deep or shallow, is advisable.

WORKING LAND AFTER FIRST CROP.

Inquiries are often made as to what should be done after taking off the first crop on new land, the principal being as to whether the land should be ploughed, or cultivated, or sown without any cultivation whatever.

This, however, can only be determined by circumstances. In districts with heavy clay soil, a satisfactory crop may be expected from burning the stubble of the former crop and sowing with or without cultivation ; although a shallow cultivation after the stubble is burnt usually gives the best results.

In districts with light soils and especially with gravelly subsoil, cultivation before seeding is necessary.

After taking the second crop from breaking or back-setting, there can be no doubt that the land should be well fallowed to put it in proper condition for succeeding crops. If the fallow is well made and the process is repeated every third year, the settler will have started on the right road to future success.

CATTLE.

The herd of pure-bred cattle on the Farm is growing slowly and needs new blood to improve its quality.

When the Holsteins were dispensed with there were only six pure-bred Short-horn females on the Farm, and from these the increase has been very slow, from the fact that the calves have been nearly all males, which have been sold or sent to other Experimental Farms.

At present the herd consists of thirteen pure-bred Short-horn females and four bulls, and one bull each of the Guernsey and Ayrshire breeds. There are also eighteen grades.

A few first-class Short-horn females are greatly needed to keep the herd on the Farm up to the requirements of the country.

Fifteen Short-horn grade steers have been purchased this fall for use in a feeding test which will be carried on during the winter.

Since last report, the following pure-bred male has been sold for breeding purpose: Short-horn 'Strathcona,' to A. Isbister, Fort Qu'Appelle.

TEST OF DEHORNING STEERS.

During the autumn of 1900, fifteen 3-year-old steers were obtained from ranchers in the vicinity of Indian Head for use in the test of the practicability of dehorning.

On November 27, after a preparatory feeding of forty-two days, a sixteen weeks' test was commenced to determine :

1st. What loss, if any, is occasioned by the process of dehorning, and

2nd. If feeding loose in a box-stall, rendered possible by dehorning, has any advantage over stall-feeding.

On the above date, the fifteen animals were divided into three lots of approximately equal weight :—

Lot No. 1. Five steers, left in a natural state and tied up.

Lot No. 2. Five steers, dehorned (by sawing off horns with a small hand-saw) and tied up, and

Lot No. 3. Five steers, dehorned (by the same method as above) and put in a loose box.

The three lots received a uniform ration throughout the test, which consisted of :—

During the first four weeks, each animal per day—

	Pounds.
Ensilage (made from green oats)	16
Straw (wheat)	12
Meal	4

During second four weeks, each animal per day—

	Pounds.
Ensilage (made from green oats)	16
Straw (wheat)	12
Meal	8

During third four weeks, each animal per day—

	Pounds.
Ensilage (corn)	16
Straw (barley and oat)	12
Meal	10

During fourth four weeks, each animal per day—

	Pounds.
Ensilage (corn)	16
Straw (barley and oat)	12
Meal	12

The straw was cut and the meal consisted of two parts of ground barley to one part of ground wheat. The steers were fed three times daily, and watered twice.

For a few days after the operation, no effect of the dehorning was noticeable on the animals; but after that time they all went off their feed and for about a week were apparently very sick. The recovery, however, was rapid.

Following will be found a statement of the monthly and total weights and gains of each lot of steers during the period of the test ; weights and gains made by the bunch during the whole period (October 15 to May 10; the total amount and estimated value of feed consumed during the same time, and a summary of the financial results of the transaction : —

MONTHLY and total weights and gains of each lot of steers during the period of test.

Lot.	Weight at Start of Test.	1st Four Weeks.		2nd Four Weeks.		3rd Four Weeks.		4th Four Weeks.		Total Gain.
		Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	Weight.	Gain.	
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
No. 1..........	6,390	6,440	50	6,780	340	6,960	180	7,180	220	790
" 2..........	6,400	6,200	Loss 200	6,470	270	6,700	230	7,000	300	600
" 3..........	6,400	6,460	Gain 60	6,900	440	7,120	220	7,490	370	1,090

TOTAL weight and gain made during the whole period—October 15 to May 10.

Lot.	Weight when bought October 15.	*Weight when sold May 10.	Gain.
	Lbs.	Lbs.	Lbs.
No. 1..........	6,260	7,380	1,120
No. 2..........	6,290	7,300	1,010
No. 3..........	6,180	7,640	1,460
Total..........	18,730	*22,320	3,590

*Less 5 per cent shrinkage, 21,204 pounds.

TOTAL weight and estimated value of feed consumed during the whole period—October 15 to May 10.

Preparatory feeding, each lot (5 steers) 42 days—

Ensilage, 16 lbs. per day, 3,366 lbs. at \$2 per ton..........	3 36
Straw, 12 lbs. per day, 2,520 lbs. at \$1 per ton..........	1 26
Meal, 4 lbs. per day, 840 lbs., at ⅔ cent per lb..........	5 60
	\$10 22

Or for the three lots, \$30.66.

During test (112 days), each lot—

Ensilage, 8,960 lbs. at \$2 per ton..........	\$ 8 96
Straw, 6,720 lbs. at \$1 per ton..........	3 36
Meal, 4,760 lbs. at ⅔ cent per lb..........	31 73
	\$44 05

Or for the three lots, \$132.15.

From end of test till sold (51 days), each lot—

Ensilage, 16 lbs. per day, 4,080 lbs. at \$2 per ton..........	\$ 4 08
Straw, 12 lbs. per day, 3,060 lbs. at \$1 per ton..........	1 53
Meal, 12 lbs. per day, 3,060 lbs. at ⅔ cent per lb..........	20 40
Oil-cake, ½ lb. per day, 127½ lbs. at 3½ cents per lb..........	4 45
	\$30 46

Or for the three lots, \$91.38.

Summary of cost of feeding—

During preparatory feeding	$ 30 66
During test	132 15
Till sold	91 38
	$254 19

Or for each steer, $16.94.
Or for each lot of five steers, $84.73.

SUMMARY of Financial result of the Transaction.

Lot.	Weight bought.	At	Amount paid.	Add Cost of Feed.	Total cost.	Weight sold.	At.	Amount received.	Gain, each Lot	Gain per Head.
	Lbs.	Cts.	$ cts.	$ cts.	$ cts.	Lbs.	$ cts.	$ cts.	$ cts.	$ cts.
No. 1	6,260	3	187 80	84 73	272 53	7,011	4 60	322 50	49 97	9 99
No. 2	6,290	3	188 70	84 73	273 43	6,935	4 60	319 02	45 59	9 11
No. 3	6,180	3	185 40	84 73	270 13	7,258	4 60	333 86	63 73	12 74
Total	18,730	3	561 90	254 19	816 09	21,204	4 60	975 38	159 28	*

* Or an average net gain of $10.62 per head.

SWINE.

There are at present, three breeds kept on the Farm, namely, Berkshire, Tamworth and Yorkshire White.

A pair of Yorkshire Whites and a young Tamworth boar were received from the Central Experimental Farm in June last.

The young animals from any of the above mentioned breeds find ready sale, and with the high price of pork there is no better paying business in the country than hog-raising ; although at present very few are engaged in the work.

POULTRY.

Two breeds, Black Minorcas and White Wyandottes, have been kept the past year. The former has given the better returns both in eggs and chickens, and, in fact, for some years has proved the most satisfactory breed to keep.

The only objection to Black Minorcas is their comb, which, however, cannot be considered a detriment where fairly comfortable quarters are provided for the winter months.

HORSES.

There are at present thirteen horses on the Farm. Two of these were brought up when the Farm was started, nearly fifteen years ago, and they are becoming almost too old for work. Two others, obtained later, are also showing signs of giving out.

INSTITUTE MEETINGS.

During the past year, meetings arranged by the Department of Agriculture of the North-west Government, in Southern and Northern Alberta and in the South-eastern portion of Assiniboia, have been attended.

In February, in company with Mr. J. H. Grisdale, Agriculturist of the Central Experimental Farm, Ottawa, and Mr. George Lang, of Indian Head, a most interesting trip was taken in Southern Alberta, when Lethbridge, Magrath, Cardston, Mountain View, Fishburn and Pincher Creek were visited.

At Lethbridge, small-pox had unfortunately broken out and a public meeting could not be held, but a number of leading citizens met in the Town Hall and the matter of tree-planting was fully discussed. From the fact that irrigation had lately become available at Lethbridge, tree-planting was a very live question and was gone into in all its details.

At Magrath, a new Mormon settlement between Cardston and Lethbridge, on the line of the Irrigation canal, two very large and interesting meetings were held. As all the settlers in this neighbourhood had lately arrived from Utah, U.S.A., and were unacquainted with the methods of farming in the Canadian North-west, very close attention was paid to all that was said at both meetings. Fall wheat had been sown the previous fall on new breaking, and at the time of our visit was not discernable above ground ; although the return proved highly satisfactory, the yields are said to have varied from 40 to 50 bushels per acre.

At Cardston two meetings were held ; the one in the afternoon being very large and interesting. In the evening however, a Mormon wedding in the town proved too strong a counter attraction.

The meetings at Mountain View, Fishburn and Pincher Creek, all of which are in the foot-hills of the Rocky Mountains, were well attended.

At all the meetings Mr. Grisdale spoke on Live Stock, Mr. Lang on Tree Culture, while I paid particular attention to the cultivation of the soil for grain and hay.

On returning from Alberta, a series of meetings was attended in company with Mr. George Harcourt of the *Nor'-west Farmer,* Winnipeg, in South-eastern and Eastern Assiniboia, the following towns being visited :—Weyburn, a new settlement on the Soo line of railway ; Gainsboro, Elmore, Carnduff, Carlyle, Cannington Manor, Glen Adelaide, Fleming and Moosomin. At the two latter places Mr. D. Anderson, an Institute worker from the province of Ontario, joined us and addressed the meetings. All the meetings were well attended, especially good gatherings being present at Weyburn, Elmore and Carnduff. Mr. Harcourt spoke on Live Stock, and I spoke on Grain, Grasses and Tree Culture.

During July I accompanied Dr. Jas. Fletcher, Entomologist and Botanist of the Experimental Farms, at a series of meetings in Northern Alberta, and with us at different places were Mr. Maerker, Superintendent, of Dairies for Alberta ; Mr. W. N. Willing, Territorial Weed Inspector, and Mr. Blakely of the Nor'-West Farmer Winnipeg.

Olds, Innisfail, Red Deer, Strathcona, Clover Bar, Fort Saskatchewan, Leduc Wetaskiwin, Ponoka and Lacombe were visited and meetings held. At that time the weather and roads were very bad, the latter in some places being almost impassable, so that the attendance on the whole was not large. As these meetings were called for the purpose of discussing weeds and their eradication, Dr. Fletcher was the chief speaker and went into the matter most thoroughly.

DISTRIBUTION OF SAMPLES.

During the months of March, April and May, the following distribution of samples was made to applicants throughout the Territories of Assiniboia, Alberta and Saskatchewan.

The number of applicants was, as usual, largely in excess of the supply of material available for this purpose ; and the stock of seedling trees and shrubs, cuttings of fruit bushes, rhubarb roots and tree seeds grown for this purpose did not begin to fill all the requests received.

Besides the seedlings mentioned below, many thousands of maple trees, from 3 to 5 feet in height, were given to settlers in the districts surrounding the Farm.

Grain.—Wheat, 252 bags, 3 pounds each.
" Oats, 414 bags, 3 pounds each.
" Barley, 68 bags, 3 pounds each.
" Pease, 200 bags, 3 pounds each.
" Sundries, 43 bags, 3 pounds each.
Potatoes, 652 bags, 3 pounds each.
Tree-seeds, Maple, 607 bags, 1 pound each.
Grass-seed, Brome, 261 bags, 1 pound each.
Grass-seed, Western Rye grass, 18 bags, 1 pound each.
Small-seeds, 705 packages, containing 7,986 pa. shrub-seeds, flower-seeds, root-seeds, garden-seeds and corn.
Fruit-bushes, 145 packages.
Tree and shrub seedlings, 217 packages.
Fruit bushes and tree and shrub seedlings, 146 packages.
Rhubarb roots, 98 packages.
Express packages, 43, containing maple trees, 755 ; elm, 140 ; artemisia, 1,000 ; seedling plums, 190 ; sundry shrubs, 900.

CORRESPONDENCE.

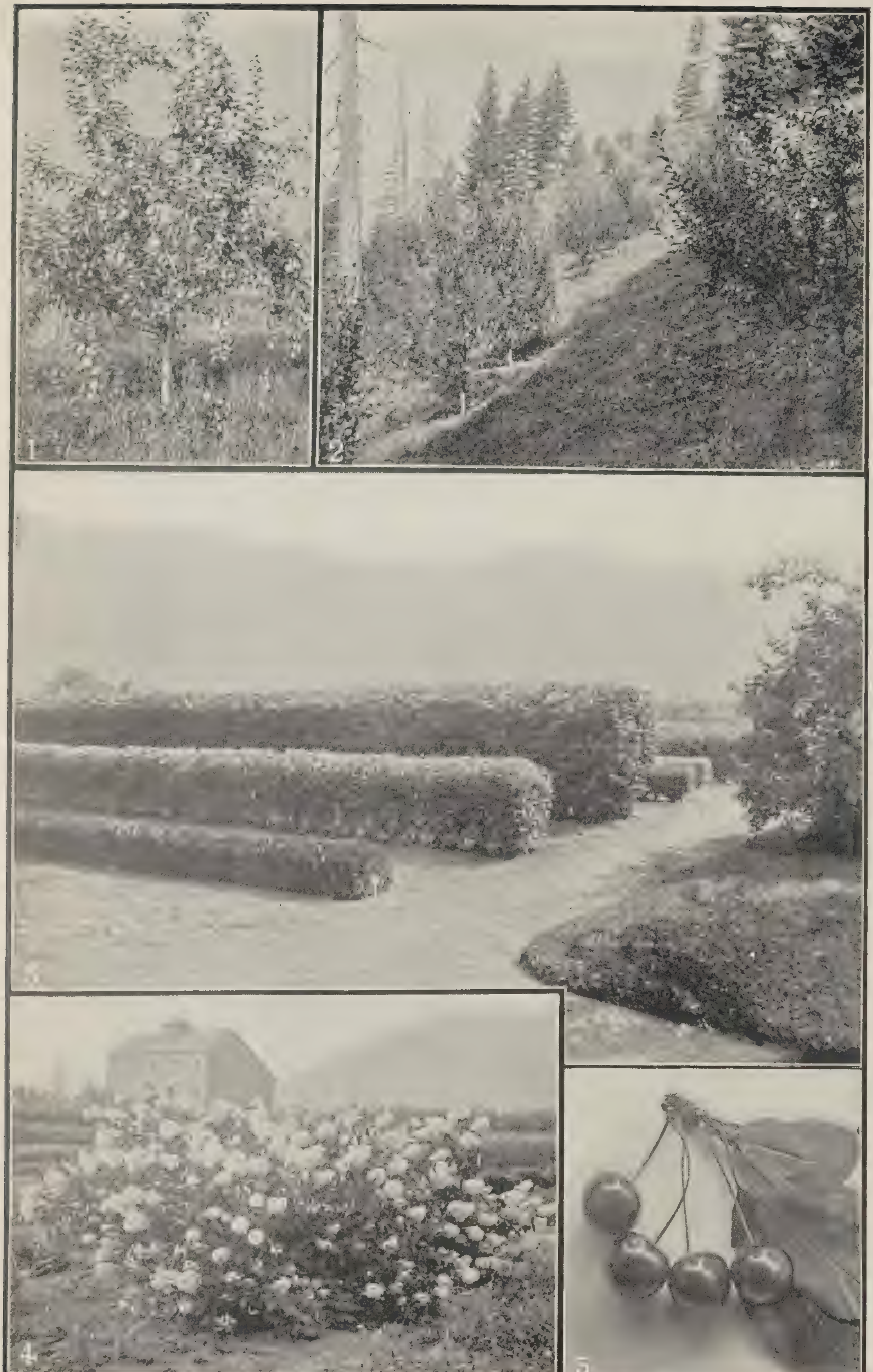
During the twelve months ending October 31, 1901, 5,410 letters were received, and 5,333 mailed from this office. In letters received, circular reports on grain and other samples are not counted, and in letters mailed, circulars of instruction sent with grain and other samples are not included.

METEOROLOGICAL OBSERVATIONS.

Month.	Highest Temperature.		Lowest Temperature.		Snow-fall.	Rainfall.		Hours of Sun-shine.
	On	Degrees	On	Degrees	Inches.	No. of Days.	Inches.	
1900.								
November	1	52	20	—28	10	....	....	52·6
December	17	38	31	—32	8	....	....	42·2
1901.								
January	13	35	1	—37	15	....	....	59·6
February	28	40	4	—29	3	....	....	107·7
March	1	42	4	—20	2	....	....	124·6
April	30	79	17	— 9	17	7	1·43	139·3
May	17	95	6	28	....	2	·87	293·8
June	1	80	7	31	....	12	5·62	144·5
July	12	89	2	44	....	10	5·82	222·9
August	26	91	8	36	....	0	·0	230·5
September	2	81	28	22	25	6	4·9	80·5
October	20	75	31	15	....	1	1·58	159·0
					80	38	20·22	1657·2

NOTE.—The rainfall in April and September includes melted snow.

I have the honour to be, sir,
Your obedient servant,
ANGUS MACKAY,
Superintendent.



SCENES ON EXPERIMENTAL FARM, AGASSIZ, B.C.

1. Apple tree in fruit. 2. Part of Orchard on side of mountain. 3. Hedges. 4. Hydrangea paniculata. 5. Cluster of cherries.

EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., Nov. 30, 1901.

To DR. WM. SAUNDERS,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour herewith to submit my report of the experiments carried on and progress of the general work of the Experimental Farm for the year 1901.

The season has been on the whole a favourable one for hay, grain and root crops, but unfavourable for fruits. January was rather stormy, alternating between snow, and rain, the year opening with snow on the ground, and there were several falls agregating nineteen inches, which lay until the 11th, when it began to rain. From then to the end of the month there was a little over five inches, but it was never very cold, the lowest temperature being on the 9th, when it reached 11 degrees above zero. February was milder, and fairer, the rainfall being only 2¾ inches, and the snowfall 7 inches, the lowest temperature was on the fifth when it registered 16 above zero. March was milder, 6 degrees of frost on the 24th being the lowest point reached, but there were seventeen rainy days, and the rains were cold, and very disagreeable. Peach, apricot, nectarine, almond, and early blossoming plums were in bloom in the last few days of the month, and the last 8 days of the month were stormy, which was injurious to the fruit blossoms.

April opened with a fall of two inches of snow, followed by rain storms up to the 5th when there was another snowfall of two inches, and the month continued cold and wet, there being fourteen rainy days with the prevailing winds from the north, north-east and north-west, with light frosts on a number of mornings. On the 18th the temperature fell to 28 which was disastrous to the fruit crop generally. May continued cool, and rather wet with rain storms on thirteen days and the wind mostly from the north. June began with rain on the first nine days, and cool westerly, and north-westerly winds, rain fell on 21 days, there were only 80 hours of sunshine in this month. Under these conditions, it was almost impossible to cure clover hay, and growth up to the end of this month was backward.

July was fine, clear and bright, there being only seven showery days with a rainfall for the month of 1¼ inches. August was dry and warm throughout, it being the first month since the meteorological records have been kept at this station, that there was no rain to record, and only a few cloudy days. September was another beautiful month, with about 1½ inches of rain, and the lowest temperature recorded was 35 on the 28th. There were a few light showers on the 10, 11, 12, and 13th of October, and bright warm days up to the latter part of the month when it began to rain and rained pretty steadily up to the close of the month.

The first frost of the season came on November 11, up to which time it had rained very frequently from the first.

The rainfall as a whole has been much the lightest for some years, but the number of rainy days in the winter and spring months has been greater than usual, especially in the months of April, May and June, and as the prevailing winds in those months were from a northerly direction, they were usually cool months, and unfavourable for the growth of fruits.

In July a new circular silo 15 feet in diameter and 30 feet deep was put up in the barn, and is now nearly filled with corn. The old silo which was put in when the barn was built had decayed on the inside, and was no longer fit for service.

THE FRUIT CROP.

The fruit crop has been a poor one owing to the very unfavourable spring weather, and as a result few trees set fruit, and the continued rains in May and June prevented effective spraying and in consequence scab on apples and brown rot of the cherry and plum, seriously damaged what fruit did set.

HEDGES.

The sample hedges have made satisfactory growth and are very much admired, and of great interest to visitors to the Farm, and many examine them with a view to a selection for their own places.

FOREST AND TIMBER TREES.

The forest trees planted in the shelter belt continue to make vigorous growth, and the nut and timber trees planted on the mountain sides are making fair progress.

ORNAMENTAL SHRUBS AND TREES.

The ornamental shrubs and trees have done well this season, having made a fine growth, and the flowering shrubs and trees have been very beautiful with a wealth of bloom from early spring, beginning with the Forsythias early in March, and ending with the Japan Hydrangeas which are still in bloom.

NUT TREES.

The English, Japanese, American and Heart-shaped walnuts all fruited this year. The Spanish and Japan chestnut trees also produced a few nuts. The crop of filberts was as usual a very poor one and the blue jays carried off many of the nuts before they were fully ripe. Owing to the poor cropping of the filberts and the depredations of the blue jays, which are very plentiful in most districts, it is not at all likely to become a popular bush to plant.

Most of the nuts saved have been distributed to farmers who want to try a few trees on their own farms.

The hardshell almonds did not fruit this year, and the soft-shell varieties, although most of them are fairly large trees, have never borne fruit and may be regarded as useless in this climate.

DITCHING.

The ditch mentioned in my last report has been extended 720 yards further, and the part previously dug has been deepened and widened.

Part of the ditch dug this year was very difficult as owing to ridges to be cut through between sloughs it was in some places over 8 feet wide on top and more than that deep, these deep places are being boxed with 2-in. fir plank and will be filled in.

This was necessary on account of the inconvenience of so deep and wide an open ditch and the trouble in keeping it open on account of the sides caving in.

The ditch has already done good service and land that in some places was formerly covered with water all the year was firm and solid this autumn and will be fit for cultivation in another year.

CLEARING.

About fifteen acres have been cleared of brush and timber and seeded to clover and orchard grass. A very fair catch has been obtained and it will make considerable pasture next season. About 1,200 yards of wire fencing was put up last spring enclosing the new land, and a piece of bush which it is intended to clear in the same way.

LIVE STOCK.

The cattle bought last year for feeding were sold during the winter and spring, except three head, a grade milk cow and two young steers. The young shorthorn bull then on the Farm has been sold and a fine young one sent from Ontario in his stead. At the same time fourteen registered shorthorn heifers were sent out, six of these were forwarded to the British Columbia Dairymen's Association's sale at Victoria and sold, leaving at present on the Farm fourteen pure bred shorthorns and four grades.

SHEEP.

Since my last report a Dorset ram has been added to the stock and one young ram sold, and we have now nine ewes and one ram.

PIGS.

The stock of pigs at present consists of one pure bred Berkshire boar, one Berkshire sow and six young pigs. Two Tamworth sows and eight young pigs and four cross-bred pigs. There is more call for pure Tamworth stock now than at any previous time, and wherever they are introduced they are well thought of.

BEES.

The bees did not winter well and two feeble swarms were all that came through. A new queen was got for these in the spring and the two colonies united. This gave three swarms, and we have now four colonies that are well supplied with honey and should go through the winter in good condition.

POULTRY.

There are five breeds of poultry on the farm: Light Brahmas, White Wyandottes, Silver Laced Wyandottes, Barred Plymouth Rocks and Black Minorcas.

All the poultry are healthy and thrifty, and the chickens strong.

A Cyphers incubator was procured last April of 120 egg capacity. By the first hatch we had 65 strong chickens out of 88 fertile eggs. The incubator was filled again, and out of 95 fertile eggs there were hatched 50 chickens.

The Minorcas prove the best layers here and their eggs are large, but the chickens are rather delicate and difficult to raise as they feather so young.

The Brahmas are good layers and the chickens are hardy and easy to raise. The parent stock should be kept thrifty by having a large run, a variety of food, and change of male bird every year. It is always necessary for the heavy breeds to have a large run, otherwise their eggs will not hatch well, neither will their chickens be strong.

The Barred Plymouth Rocks have done very well ; they lay nearly as well as the Brahmas, and their eggs produce strong chickens, which matured a little earlier than the Brahmas. They make a fine lot of even looking pullets and cockerels. Only one of the B. P. Rock chickens died of illness. One B. P. Rock cockerel weighed 6 lbs. at five months old, and a Brahma cockerel of same age weighed 5¾ lbs. A Silver Laced Wyandotte and White Wyandotte cockerel weighed each 5½ lbs. at five months' old. These chickens were well cared for but were not fattened and were always at large, when the weather was dry.

The Silver Laced Wyandottes and White Wyandottes are good fowls, both for eggs and chickens, but are not quite so profitable here as the Brahmas and B. P. Rocks.

The Poultry are all allowed to run at large, except when put into pens for breeding purposes, from January 1 to July. They are comfortably housed and regularly fed, but are never forced either for fattening or for eggs.

In allowing the hens to run at large not only are they much better and healthier than when confined, but they also pick up many injurious insects on the lawn, and in the fruit orchards. When the weather is fine they go a long distance from the hen house, and are a very great benefit to the whole farm in picking up grasshoppers and other insects.

EXPERIMENTS WITH OATS.

Sixty-three varieties of oats were sown in the uniform test plots. All were sown April 18 at the rate of 2½ bushels per acre, on sandy loam which had been in pease in 1900 following clover. The size of plots was one-fortieth of an acre. There was very little rust and no smut, and the sample is a very fair one and the yield in most cases very good. The weight per bushel is obtained by weighing a half bushel of the oats as they come from the threshing machine.

Six plots were also sown with Banner Oats using different quantities of seed per acre to ascertain what effect this might have on the crop.

OATS.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre		Weight per Bushel.	Rusted.
			In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
Golden Tartarian	Aug. 20	124	40	Medium	11	Sided	6,280	103	18	35¾	Slightly.
Black Beauty	" 20	124	48	Stiff	11	Branching	5,700	101	6	36¼	None.
Wide Awake	" 19	123	36	Slender.	7	"	5,560	100	..	35¼	"
Holland	" 20	124	52	Stiff	9	Sided	6,400	97	2	36	"
Buckbee's Illinois	" 20	124	48	Medium	11	Branching	6,000	95	10	35	"
Lincoln	" 16	120	48	Stiff	8	"	5,200	94	24	34½	"
Holstein Prolific	" 20	124	36	"	8	"	6,720	94	4	35	"
White Schonen	" 16	120	42	Medium	8	"	6,320	93	18	34½	"
Early Golden Prolific	" 19	123	40	"	10	"	5,200	93	8	36¼	"
Salines	" 16	120	42	"	6	"	6,200	92	32	36¼	"
Hazlett's Seizure	" 20	124	42	"	9	"	6,600	91	26	35½	"
Salzer's Big Four	" 21	125	36	"	8	"	3,600	91	26	34½	Slightly.
Cream Egyptian	" 20	124	42	Stiff	9	"	5,720	91	6	35½	"
Danish Island	" 22	126	48	"	9	"	6,440	91	6	35	None.
King	" 21	125	42	"	10	"	6,600	90	..	34¾	Slightly.
Brandon	" 16	120	36	"	8	Sided	3,400	89	14	34¾	None.
Abyssinia	" 21	125	42	Medium	9	Branching	6,400	89	4	34¾	"
Early Gothland	" 16	120	36	Stiff	9	"	5,880	89	4	36½	"
Russell	" 20	124	42	"	9	"	6,240	88	8	36	"
Master	" 22	126	40	"	10	"	6,000	87	22	35	"
Early Blossom	" 14	118	42	Medium	9	Sided	5,040	87	2	34	"
American Triumph	" 21	125	48	Stiff	8	Branching	6,080	86	26	35	"
Oderbruch	" 16	120	42	Medium	8	Sided	6,400	86	16	34	"
White Russian	" 16	120	42	Stiff	8	Branching	4,240	85	30	35	"
Olive	" 16	120	40	"	7	Sided	4,000	85	10	34	"
White Giant	" 16	120	44	"	7	"	4,480	82	12	34	"
California Prolific Black	" 19	123	42	Medium	8	"	6,400	81	26	34	Slightly.
Early Archangel	" 21	125	40	"	8	Branching	4,200	81	6	34	None.
Tartar King	" 20	124	46	Stiff	9	Sided	4,040	80	20	34½	"
Abundance	" 16	120	36	Medium	8	Branching	6,400	80	..	34	"
Oxford	" 16	120	42	"	9	"	6,200	80	..	34	"
Scotch Potato	" 20	124	40	"	9	....	5,200	78	28	34	"
Improved Ligowo	" 20	124	46	Stiff	8	Branching	4,600	78	18	35	"
New Zealand	" 16	120	38	Medium	8	Sided	4,800	78	8	34	"
Bonanza	" 21	125	42	"	9	Branching	6,200	77	22	35	"
Golden Beauty	" 21	125	48	Weak	9	"	5,600	77	22	34	"
Banner	" 14	118	44	Medium	10	"	3,360	77	12	34½	"
Prolific Black Tartarian	" 14	118	38	Weak	10	Sided	4,000	77	2	35	"
Pioneer	" 14	118	40	Medium	10	Branching	5,800	75	..	34½	"
Siberian	" 20	124	36	Weak	8	"	6,480	74	4	34	Slightly.
Pense	" 14	118	48	Stiff	7	Sided	5,920	74	4	34	None.
Goldfinder	" 20	124	40	Medium	9	"	4,200	73	8	34	Slightly.
Golden Giant	" 16	120	36	"	7	"	4,480	72	32	34	None.
American Beauty	" 16	120	42	Stiff	10	Branching	4,400	72	22	34½	"
Black Mesdag	" 8	112	48	Medium	10	"	3,200	72	12	35	"
Milford	" 16	120	30	Weak	7	Sided	5,200	72	12	35½	"
Bavarian	" 14	118	40	Stiff	9	Branching	6,000	71	26	34½	"
Thousand Dollar	" 16	120	42	"	9	"	4,400	71	6	34	"
Improved American	" 16	120	42	"	8	"	4,320	70	20	34	"
Flying Scotchman	" 14	118	38	"	11	"	4,280	70	..	35½	"
Longhoughton	" 20	124	40	"	9	"	5,200	69	14	36	"
Wallis	" 14	118	48	Medium	6	"	3,680	68	28	34	"
Waverley	" 14	118	44	Stiff	9	"	4,720	68	18	35	"
Cromwell	" 16	120	42	Medium	6	"	4,640	68	8	34½	"
Mennonite	" 14	118	38	"	8	"	5,120	68	8	34	"
Miller	" 16	120	36	Weak	6	"	4,640	67	32	34	"
Rosedale	" 16	120	36	Medium	6	"	4,240	67	32	35	"
Joanette	" 14	118	36	Weak	9	"	5,000	67	2	34	"
Early Maine	" 14	118	42	Medium	8	"	4,880	66	16	34	"
Kendal	" 16	120	42	"	8	Sided	3,560	66	6	35½	"
Columbus	" 16	120	42	Stiff	9	Branching	4,800	65	30	35	Slightly.
Sensation	" 14	118	40	"	8	"	4,880	63	18	34	None.
Newmarket	" 16	120	36	Medium	6	"	4,240	62	12	34	"

OATS.—Effect of using different quantities of seed per acre.

Name of Variety.	Seed per Acre.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	
	Bush.				Ins.		Ins.		Lbs.	Bu.	Lbs.
Banner	1½	April 30	August 15	107	39	Medium. .	7	Branching. .	4,640	65	30
"	2	" 30	" 15	107	39	" ..	7	" ..	5,040	70	20
"	2½	" 30	" 15	107	39	" ..	7	" ..	5,440	69	14
"	3	" 30	" 15	107	39	" ..	7	" ..	5,680	80	00
"	3½	" 30	" 15	107	39	" ..	7	" ..	5,400	72	32
"	4	" 30	" 15	107	39	" ..	7	" ..	5,040	71	26

EXPERIMENTS WITH BARLEY.

Fifty-two varieties of barley have been under trial, 22 of which were two-rowed sorts and thirty six-rowed.

They were all sown at the rate of two bushels per acre April 17, on plots of one-fortieth of an acre with seed from heads selected from the experimental plots of the previous year. The soil was a gravelly loam and fairly uniform.

Four plots of two-rowed and the same number of six-rowed varieties were sown with unselected, but carefully cleaned seed. When the barley was nearly ripe there were a few days of bright, hot sunshine which ripened the plots nearly all together, but an improvement in the appearance of the crops from selected seed over the ordinary seed was apparent from the time all were headed out. There was no rust on any of the plots.

Six plots alongside were sown with Mensury to compare the results from using different quantities of seed per acre.

TWO-ROWED BARLEY.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Ins.		Ins.	Lbs.	Bu.	Lbs.	Lbs.
Beaver........................	August 7	112	42	Stiff......	3	7,600	61	2	48¾
Prize Prolific................	" 14	119	40	"	4	6,200	59	8	48¼
Standwell	" 12	117	44	"	3½	5,920	55	40	49
Leslie........................	" 10	115	46	"	3½	5,600	52	46	48¾
Nepean........................	" 10	115	46	Medium. .	3½	5,600	52	24	49
Newton	" 8	113	42	" ..	3	5,280	51	42	48
French Chevalier..............	" 13	118	42	" ..	4	4,080	51	42	49½
Logan.........................	" 6	111	43	" ..	3	5,840	51	12	48¼
Harvey........................	" 6	111	42	" ..	3½	5,480	51	2	48½
Kinver Chevalier..............	" 12	117	40	" ..	4½	4,120	50	40	48½
Bolton........................	" 7	112	42	Stiff......	3	6,840	50	40	49
Jarvis........................	" 6	111	40	Weak	3½	5,680	50	40	48¼
Canadian Thorpe...............	" 10	115	42	Medium. .	3	3,400	50	20	49
Dunham........................	" 7	112	41	Stiff......	3½	5,880	50	..	48
Kirby	" 7	112	42	Medium. .	3	5,720	47	24	48½
Danish Chevalier..............	" 10	115	36	Stiff......	3½	3,000	47	4	48
Gordon........................	" 8	113	46	"	3	4,600	46	32	49½
Clifford......................	" 6	111	42	"	3½	3,920	46	22	48½
Victor	" 10	115	38	Medium..	3½	4,980	45	40	48
Fulton........................	" 7	112	44	Stiff......	3	3,200	38	16	48
Sidney	" 12	117	40	"	3½	3,480	37	44	48
Invincible	" 13	118	40	"	3½	3,600	34	8	48

SIX-ROWED BARLEY.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
			Inches.		Ins.	Lbs.	Bush.	Lbs	Lbs.
Royal	Aug. 5 ..	110	38	Medium ..	3	5,920	67	24	49
Nugent	" 8 ..	113	44	Stiff	2½	6,280	61	12	48¾
Common	" 8 ..	113	38	"	2	5,480	60	40	48
Claude	" 7 ..	112	42	"	3	6,440	60	40	48¼
Mensury	" 5 ..	110	44	"	3½	7,000	59	28	48½
Mansfield	" 10 ..	115	44	"	3	4,880	59	18	48
Odessa	" 8 ..	113	38	Medium ..	2½	6,040	59	8	48
Yale	" 8 ..	113	40	Stiff	2½	5,280	58	36	48¼
Empire	" 6 ..	111	46	"	3	5,480	58	26	48½
Argyle	" 8 ..	113	42	"	2½	5,320	58	16	48
Blue Long Head	" 7 ..	112	40	"	3	5,280	57	4	48¾
Petschora	" 3 ..	108	36	"	3	4,800	55	20	48
Rennie's Improved	" 5 ..	110	38	Medium ..	2½	5,780	54	28	48¾
Excelsior	" 2 ..	107	40	Stiff	2	5,320	54	28	48½
Albert	" 8 ..	113	40	"	2½	5,960	54	28	48
Baxter	" 3 ..	108	37	Medium ..	2¼	4,840	53	32	48½
Phœnix	" 5 ..	110	40	" ..	2½	5,480	52	46	48¼
Brome	" 8 ..	113	40	Stiff	3	5,440	52	16	48½
Pioneer	" 5 ..	110	40	"	3	5,640	52	16	48
Oderbruch	" 2 ..	107	42	Medium ..	3	4,520	51	44	48
Champion	" 2 ..	107	38	Stiff	2½	4,840	51	4	48
Trooper	" 8 ..	113	34	Weak	2	5,640	50	40	48
Success	" 2 ..	107	36	"	2½	6,200	50	30	48
Stella	" 8 ..	113	42	Medium ..	3	6,020	47	14	48
Vanguard	" 5 ..	110	40	" ..	3½	5,360	47	14	48
Garfield	" 7 ..	112	40	" ..	2	4,880	47	4	48
Summit	" 6 ..	111	40	" ..	3	5,080	47	4	48
Surprise	" 8 ..	113	36	Weak ..	2½	5,040	45	40	48
Hulless Black	" 5 ..	110	34	"	2½	5,000	45	20	60
Hulless White	" 5 ..	110	40	Stiff	2½	4,520	45	..	60

BARLEY.—Test of Varieties grown from Screened Seed on plots of one-fortieth acre.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
				In.		In.	Lbs.	Bush.	Lbs.
Six-rowed—									
Mensury	April 17 ..	Aug. 6 ..	111	44	Stiff	3	5,840	56	38
Nugent	" 17 ..	" 8 ..	113	44	"	3	6,400	58	28
Champion	" 17 ..	" 2 ..	107	38	"	2	3,480	49	26
Mansfield	" 17 ..	" 10 ..	115	42	"	3½	4,480	57	8
Two-rowed—									
Sidney	April 17 ..	Aug. 12 ..	117	40	"	3½	3,480	36	40
Canadian Thorpe	" 17 ..	" 10 ..	115	40	"	3	3,200	50	..
Nepean	" 17 ..	" 10 ..	115	44	"	3½	5,600	51	32
Kinver Chevalier	" 17 ..	" 12 ..	118	42	"	4	3,880	50	20

BARLEY, SIX-ROWED.—Results of using different quantities of seed per acre on plots of one-fortieth acre each.

Name of Variety.	Seed per Acre.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Bush.				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
Mensury......	1½	April 30	Aug. 10	102	40	Stiff and bright..	3 to 3½	4,000	43	16	49
"	2	" 30	" 10	102	40	" ..	3 " 3½	4,400	48	16	49
"	2½	" 30	" 9	101	44	" ..	3 " 3½	5,600	55	40	49
"	3	" 30	" 9	101	44	" ..	3 " 3½	5,480	62	8	49
"	3½	" 30	" 8	100	44	" ..	3 " 3½	5,400	56	2	48
"	4	" 30	" 8	100	38	" ..	3 " 3½	3,480	46	32	48

EXPERIMENTS WITH SPRING WHEAT

Seventy-one varieties of spring wheat were tested this year on plots of one-fortieth of an acre each. The soil was a sandy loam, which was in clover the previous year. It was fall ploughed and thoroughly prepared in spring with a spading-harrow and smoothing-harrow. Most of the plots were sown with seed from heads selected from the plots the previous harvest. Eleven plots were sown alongside with screened seed saved from the produce of the plots when harvested without selection.

All the plots got a dressing of superphosphate of lime at the rate of one hundred pounds per acre, applied broadcast, when the plants were well above ground.

Six plots were sown with one variety of seed, to test the results of using different quantities of seed per acre. All were sown the same day and in every way the conditions were the same. The two plots with the heaviest seeding ripened a little sooner but in both cases the straw was weak and lodged.

SPRING WHEAT.—TEST OF VARIETIES.

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs
Roumanian	April 16..	Aug. 20 .	126	48	Stiff.....	3	Bearded..	7,220	52	..	60½
Ebert	" 16..	" 14..	120	42	"	2½	Beardless.	6,440	51	30	60¾
Blair	" 16..	" 19..	125	36	Medium..	3½	" ..	7,440	51	10	61
Stanley	" 16..	" 20..	126	42	Stiff......	3	Bearded ..	7,000	50	40	60½
Countess............	" 16..	" 17..	123	42	"	2½	Beardless.	6,360	50	40	60
Hastings......	" 22..	" 19..	119	44	Medium..	3½	" ..	6,600	50	..	61
Chester	" 22..	" 17..	117	42	" ..	3½	" ..	7,520	49	20	60¾
Cartier	" 22..	" 17..	117	40	" ..	3	Bearded..	6,800	48	40	61
Australian No. 9.....	" 22..	" 18..	118	44	Stiff......	3	Beardless.	6,720	48	40	61¼
Essex....	" 22..	" 19..	119	48	"	4	" ..	7,000	47	20	61
Crawford.....	" 16..	" 13..	119	41	Medium..	3	Bearded..	6,480	47	20	60
Captor	" 16..	" 19..	125	42	Stiff......	3	Beardless.	6,800	47	..	60¼
Minnesota No. 169 ..	" 16..	" 19..	125	48	"	3	" ..	7,000	46	40	61
Alpha.......... ..	" 16..	" 19..	125	48	"	4	" ..	6,520	46	40	60¾
Australian No. 23.....	" 22..	" 18..	118	50	Medium..	5	" ..	6,200	46	30	60½
Early Riga...	" 22..	" 13..	118	42	" ..	3	" ..	5,840	46	20	61
Dufferin............	" 22..	" 13..	118	43	Stiff......	3½	Bearded..	6,600	46	10	60
Australian No. 19.....	" 22..	" 19..	119	48	"	3	Beardless.	6,600	45	20	60
Laurel..............	" 16..	" 20..	126	48	"	3	" ..	5,920	45	20	60

Spring Wheat.—Test of Varieties.

Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	
Cassel	Apr. 22..	Aug. 21..	121	46	Medium ..	3½	Beardless.	5,160	44	50	60
Colorado	" 16..	" 16..	122	42	Stiff	3½	Bearded..	4,560	44	40	61
Vernon	" 16..	" 13..	119	42	"	3	" ..	5,000	44	40	60
Red Fern	" 16..	" 20..	126	48	"	3	" ..	3,400	44	40	60
Hungarian	" 16..	" 20..	126	42	Medium..	2¼	" ..	5,800	44	40	61
Australian No. 25	" 22..	" 17..	117	46	Stiff	4½	Beardless.	4,040	44	40	60½
Benton	" 22..	" 16..	116	46	Medium..	4	" ..	5,120	44	30	60
Huron	" 16..	" 19..	125	46½	Stiff	3	Bearded..	6,400	44	20	60½
Preston	" 16..	" 17..	123	40	"	3	" ..	5,200	44	..	60
Robin's Rust Proof	" 22..	" 17..	117	50	"	3¼	Beardless.	5,480	43	20	60½
Advance	" 16..	" 13..	118	46	"	3	Bearded..	5,360	43	20	59½
Minnesota No. 181	" 16..	" 20..	126	42	"	3	Beardless.	6,000	43	..	61
Pringle's Champlain	" 16..	" 19..	125	38	"	3	Bearded..	5,440	42	20	59¾
Red Swedish	" 16..	" 17..	123	38	Medium..	4	" ..	4,600	42	20	61
Bishop	" 22..	" 20..	120	46	Stiff	3½	Beardless.	6,200	42	..	60½
Beauty	" 16..	" 17..	123	42	"	3½	" ..	5,360	42	..	61
Minnesota No. 149	" 16..	" 20.	126	36	"	2½	" ..	6,200	41	40	61
Fraser	" 16..	" 12..	118	41	Medium..	3	Bearded..	3,520	41	40	61½
Ladoga	" 16..	" 12..	118	42	Stiff	3½	" ..	5,800	41	20	60
Weldon	" 16.	" 16..	122	42	Medium..	3	Beardless.	4,400	41	20	61
Plumper	" 16..	" 20..	126	42	" ..	3½	Bearded..	5,200	41	20	60
Admiral	" 16..	" 19..	125	48	Stiff	3½	Beardless.	5,200	41	20	61
Australian No. 10	" 22..	" 16..	116	48	Stiff..	4	" ..	5,120	40	40	60
Red Fife	" 16..	" 17..	123	40	"	2¾	" ..	4,640	40	30	61½
Mason	" 16..	" 19..	125	36	Weak ...	2½	" ..	5,000	40	20	60
Japanese	" 22..	" 19..	119	38	Medium..	3	Bearded..	5,600	40	10	59½
White Fife	" 16..	" 17..	123	42	" ..	3	Beardless.	5,040	40	..	60
Australian No. 13	" 22..	" 17..	117	48	" ..	3½	" ..	5,000	39	40	61
Angus	" 22..	" 15..	115	44	" ..	4	" ..	4,480	39	40	60
Crown	" 16..	" 19..	125	48	Stiff..	4	Bearded..	5,720	39	40	60
Australian No. 27	" 22..	" 17..	117	46	"	3½	Beardless.	5,120	39	40	60
Speltz	" 16..	July 29..	104	33	Medium..	2	Bearded..	3,440	39	30	40½
Dawn	" 16..	Aug. 17..	123	42	Stiff..	2½	Beardless.	5,280	39	20	60½
Progress	" 16..	" 19..	125	39	Medium..	3	" ..	5,160	39	10	59
Minnesota No. 163	" 16..	" 20..	126	36	" ..	3	" ..	4,600	38	40	60
Norval	" 16..	" 10..	116	38	" ..	3	Bearded..	3,360	38	20	60
Campbell's White Chaff	" 16..	" 19..	125	36	" ..	3	Beardless.	5,320	38	10	59½
White Russian	" 16..	" 20..	126	42	Stiff..	3	" ..	5,120	38	..	60
Blenheim	" 16..	" 17..	123	42	"	2½	Bearded..	4,680	38	..	60
Goose	" 16..	" 20..	126	36	Medium..	2½	" ..	4,480	37	40	61
Monarch	" 16.	" 20..	126	40	" ..	3	Beardless.	3,920	37	20	60
Herisson Bearded	" 16..	" 19..	125	38	" ..	2	Bearded..	4,520	37	..	60
White Connell	" 16..	" 20..	126	36	" ..	2	Beardless.	4,480	36	40	60
Percy	" 16..	" 17..	123	42	" ..	2½	" ..	4,560	37	..	60
Dion's	" 16..	" 17..	123	38	" ..	3	Bearded..	4,320	36	40	60
Rideau	" 16..	" 13..	119	44	" ..	2½	Beardless.	3,600	36	20	60½
Wellman's Fife	" 16..	" 19..	125	36	" ..	2½	" ..	5,120	36	20	60
Clyde	" 16..	" 20..	126	40	Stiff..	3	" ..	3,720	36	..	60½
Rio Grande	" 16..	" 16..	122	42	Slender ...	3	Bearded..	5,040	35	40	60
Harold	" 16..	" 10..	116	40	Weak	3½	" ..	4,080	35	20	59
Byron	" 16..	" 13..	119	40	"	3¼	" ..	5,120	34	..	60
Beaudry	" 16..	" 17..	123	48	Stiff..	3	" ..	4,800	31	..	59

SPRING WHEAT.—Test of varieties grown from screened seed.

Name of Variety.	Date of Sowing.	Date of Ripening	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
Countess	Apl. 16..	Aug. 21..	127	40	Stiff & bright	2	Beardless.	6,000	44	40	60
Stanley	" 16..	" 22..	128	40	" "	3	Bearded..	5,200	43	20	60½
Captor	" 16..	" 19..	125	42	" "	3	Beardless.	6,200	41	40	60¾
Blenheim	" 16..	" 19..	125	40	" "	2½	Bearded..	4,320	41	20	60
Red Fife	" 16..	" 18..	124	36	" "	2½	Beardless.	3,600	39	30	61
Campbell's White Chaff.	" 16..	" 19..	125	35	Medium....	3	" ..	3,400	39	20	60
Red Swedish	" 16..	" 18..	124	39	"	3½	Bearded..	4,120	38	20	61
Goose	" 16..	" 21..	127	34	"	2½	" ..	6,000	38	..	60
Mason	" 16..	" 19..	125	38	Weak	2	Beardless.	3,400	35	20	60
Dufferin	" 16..	" 14..	120	40	Stiff & bright	3	Bearded..	3,480	28	..	60
Crown	" 16..	" 20..	126	48	" "	4	" ..	4,080	26	..	61

SPRING WHEAT.—Results of using different quantities of seed per acre.

Name of Variety.	Seed per Acre.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.	
	Bush.				In.		In.	Lbs.	Bush.	Lbs.
Percy	¾	Apl. 30..	Aug. 19..	111	40	Stiff & bright.	2½	4,480	34	40
"	1	" 30..	" 19..	111	42	" " ..	2½	4,800	36	
"	1½	" 30..	" 19..	111	42	" " ..	2½	5,200	37	20
"	2	" 30..	" 19..	111	40	" " ..	2½	4,960	36	40
"	2½	" 30..	" 17..	109	40	Weak	2	4,800	39	20
"	3	" 30..	" 17..	109	40	"	2	4,320	40	20

Plots five and six were lodged as the straw was slender and soft and the heads shorter.

EXPERIMENTS WITH PEASE.

Fifty-nine varieties of pease were tested this year, side by side, in plots of one-fortieth of an acre each. The soil was a gravelly loam which had only been once cropped since it was cleaned, and a great many ferns grew on it, which to some extent, lessened the yield. Their presence in the straw partly accounts for the heavy gross yield. The straw was clean and bright, the season was favourable for pease and the yield is a fairly good average one. All the plots were sown April the 15th, but the cold weather in May and June increased the number of days to mature considerably beyond the average.

PEASE.—TEST OF VARIETIES.

Name of Variety.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Weight of Straw.	Length of Pod.	Size of Pea.	Yield per Acre. Bush.	Yield per Acre. Lbs.	Weight per Bushel.
				Inches.	Lbs.	Inches.				Lbs.
English Grey........	Aug. 21.	128	Rank.......	60	8,000	2½	Large	64	..	61¾
Harrison's Glory....	" 22.	129	"	74	6,200	3½	"	60	40	62
Duke..............	" 23.	130	Strong.	66	7,120	2½	"	60	..	61½
Early Britain......	" 15.	122	Rank.......	56	8,960	3½	"	59	20	61¾
Pride..............	" 23.	130	"	60	8,200	2	"	59	20	62
Fergus.............	" 26.	133	Strong.	48	7,040	2	Small	59	..	63
Mackay...... ...	" 21.	128	Medium....	66	7,760	2½	"	58	50	61
Arthur.............	" 20.	127	Strong. ...	48	6,400	2	Large	57	50	60½
New Potter.........	" 21.	128	"	78	6,720	2	"	57	20	60¾
Elephant Blue....	" 19.	126	"	60	8,000	2	Medium..	57	..	61¼
Agnes	" 24.	131	"	74	6,200	3¼	Large	56	50	61½
Prince Albert.......	" 21.	128	" ...	54	6,680	2½	Small	56	40	61
Perth..............	" 23.	130	"	48	7,600	2½	"	56	..	60¾
Large White Marrowfat......	" 24.	131	"	54	5,920	2	"	55	20	61
Gregory....... ..	" 19.	126	"	60	6,400	2½	Medium..	55	..	61½
White Wonder.....	" 24.	131	"	66	6,480	2	" ..	54	20	61¼
Nelson	" 16.	123	"	60	8,320	3	" ..	54	..	62
Prince.............	" 20.	127	"	42	6,400	2	Large	54	..	61½
Trilby.............	" 20.	127	Rank.......	84	6,800	2½	Medium..	52	50	60¾
Elder	" 23.	130	Medium....	60	6,300	2	" ..	52	40	61
Crown........	" 21.	128	Rank.......	54	7,360	2	Small	52	30	61
Bruce..............	" 20.	127	Strong.	52	7,040	2½	Large	52	30	60
Carleton...........	" 23.	130	Rank.......	96	8,000	2½	Medium..	52	20	60
Picton.............	" 24.	131	Strong.	60	7,600	2	" ..	52	10	60
Kent..............	" 26.	133	"	54	8,400	2	Large	52	..	60½
German White......	" 21.	128	"	54	5,200	2½	Medium..	52	..	61
Alma..............	" 20.	127	"	60	9,400	2½	Small	51	20	60
Centennial.........	" 24.	131	"	60	7,040	2	Medium..	50	40	61
French Canner......	" 21.	128	"	60	5,200	2½	" ..	50	..	61½
Vincent.	" 20.	127	"	60	6,320	2½	Large ...	49	50	60
Paragon...........	" 23.	130	"	62	6,480	2½	Medium..	49	40	62
Lanark....	" 23.	130	"	42	8,360	2½	Large	49	20	61½
Prussian Blue......	" 19	126	Medium....	54	7,600	2	Medium..	48	40	62
Creeper...........	" 15.	122	"	60	4,800	3	Small	48	40	61
Golden Vine........	" 26.	133	Rank.......	66	5,600	2½	"	48	20	61½
Daniel O'Rourke....	" 15.	122	Medium....	60	7,920	2½	"	48	10	62
Pearl..............	" 23.	130	Very rank..	102	6,720	2½	Large	48	..	60
Chancellor....... .	" 23.	130	Strong.	66	5,840	2	Medium..	48	..	61
Wisconsin Blue.....	" 26.	133	"	72	5,600	2½	Small	47	40	62½
King...............	" 24	131	"	54	5,920	2½	Large	47	20	60½
Cooper....	" 23.	130	Medium ..	54	7,600	3	"	47	10	60
Blk. Eyed Marrowfat	" 20.	127	Strong.	54	6,800	2½	"	47	10	60
Victoria...........	" 20.	127	"	58	8,200	2½	Small	47	..	61½
Herald.....	" 23.	130	"	66	6,720	2	Large	46	40	60
Multiplier..........	" 24.	131	"	66	5,360	2	Small	46	30	62½
Archer	" 24.	131	"	60	7,600	1½	Medium..	45	20	60½
Bedford...........	" 24.	131	"	56	8,040	2	" ..	44	40	60
Mummy............	" 24.	131	" ...	48	7,920	2	" .	44	..	61
Elliot.............	" 26.	133	"	66	6,160	2	Small	42	20	62½
Macoun............	" 23.	130	"	60	6,840	2	Large ...	42	..	60½
Fergus............	" 26.	133	"	48	7,060	2	Small	42	..	60½
Oddfellow..........	" 23.	130	Medium....	46	6,200	3	Medium..	41	20	62½
Fenton.....	" 16.	123	"	46	7,880	2	Large	40	20	61
Bright.............	" 26.	133	Strong.	52	5,160	2	Medium..	39	20	61
Dover..............	" 23.	130	"	60	6,720	2	Large	38	40	60
Chelsea	" 21.	128	Medium...	54	6,960	3	Medium..	38	40	62
Canadian Beauty....	" 23.	130	Strong.	60	7,040	2½	Large	37	20	60
Grass Pea.........	Sept. 3.	141	Poor.	36	4,160	1	Small	24	40	61½

Oats.—Tests with Fertilizers.

Six plots of Banner oats, one-fortieth of an acre each, were included in this test. The land was a gravelly loam, that had given a crop of wheat in 1900, following clover.

Plot 1.—One hundred pounds nitrate of soda per acre, one-half sown broadcast when the plants were well above the ground and the other half when they were about 6 inches high.

Plot 2.—Two hundred pounds nitrate of soda per acre ; one-half applied broadcast when the plants were well above ground and the other half when about 6 inches high.

Plot 3.—Check plot no fertilizer applied.

Plot 4.—Four hundred pounds superphosphate of lime per acre, scattered broadcast and lightly harrowed before the seed was sown.

Plot 5.—Four hundred pounds muriate of potash per acre ; sown broadcast and harrowed before the seed was sown.

Plot 6.—Two hundred pounds superphosphate of lime, 100 pounds muriate of potash, and 100 pounds of nitrate of soda per acre. Half of the material scattered over the surface before the seed was sown and the other half when the plants were about 2 inches above ground.

All the conditions as to soil and seed were identical. All were sown April 24, using seed at the rate of 2½ bushels per acre. All the plots ripened together and were cut the same day. There was no rust on any of the plots.

Name of Variety.	Character of Straw.	Weight of Straw.	Yield per Acre.		Proportion Rusted.
		Lbs.	Bush.	Lbs.	
Banner, Plot 1—Nitrate of soda, 100 lbs. per acre....	Medium. ...	4,600	58	28	None.
" " 2— " 200 "	" ...	5,000	62	12	"
" " 3—No fertilizer....................	Weak	3,800	54	4	"
" " 4—Superphosphate, 400 lbs. per acre...	Stiff........	5,400	68	28	"
" " 5—Muriate of potash, 400 lbs. per acre.	"	4,600	74	12	"
" " 6—Superphosphate, 200 lbs. ; muriate of potash, 100 lbs. ; nitrate of soda, 100 lbs. per acre..................	"	5,800	82	32	"

Pease.—Tests with Fertilizers.

Four plots of pease, of one-twentieth of an acre each, were sown April 15, and when the plants were about 2 inches above ground nitrate of soda, at the rate of 100 pounds per acre, was scattered broadcast over the plot, and when they were about 6 inches high another 100 pounds was applied as before.

The soil was a very gravelly loam, that was first broken up in the winter of 1899 and 1900, and pease sown in spring of 1900, but they were destroyed by cutworms. This year the vines grew very rank in each case and were extra well podded. The results are given in the following table :—

Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Yield per Acre.		Weight per Bush.
					In.	In.	Bush.	Lbs.	Lbs.
King.....	April 15..	Aug. 24..	131	Rank.....	60	3	106	20	61½
German White............ ...	" 15..	" 21..	128	"	58	3	102	..	62
Perth	" 15..	" 23..	130	"	56	3½	94	40	61
Centennial....................	" 15..	" 24..	131	" .. .	66	2¾	90	40	61

Potatoes.—Tests with Fertilizers.

Experiment was also made to test the value of nitrate of soda and superphosphate of lime applied to potatoes.

The land chosen was some of the oldest on the farm and may be considered fairly uniform in character and condition. It was in clover last year and the clover sod was ploughed under for the potato crop.

The results show, as do most experiments of similar nature, that where a clover stubble is turned under in a short rotation, nitrogen in plenty, for the crop is already in the land. There were no rotten potatoes in any of the plots.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable-	
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
Dakota Red, Plot 1—Nitrate of soda, 100 lbs. per ac.	633	36	633	36	538	36	95	
" " 2— " 150 " ..	644	36	644	36	548		96	36
" " 3— " 200 " ..	657	48	657	48	526		131	48
" " 4—Untreated....................	638		638		572	30	65	30
" " 5—Superphosphate, 100 lbs. per ac.	655	36	655	36	590	36	65	36
" " 6— " 150 " ..	688	36	688	36	617	6	71	30
" " 7— " 200 " ..	743	30	743	30	664		79	30

EXPERIMENTS WITH INDIAN CORN.

Thirty-three varieties of corn were planted in the test this year.

All were sown May 20 and 21. The land was clover sod, well harrowed and prepared and was in fine condition, but the weather in the last of May and all of June was cold and wet and the germination of the seed was delayed in consequence, and the growth was very slow until the middle of July. During the last half of July, all of August, September and most of October the weather was dry, bright and warm, and the corn made a fair growth, but the unfavourable weather in the beginning of the season put the growth back and it never recovered lost ground. Very few varieties made good ears of corn. All the varieties were tested both in hills and drills, the drills were three feet apart and the stalks thinned to about six inches in the drill. The hills were three feet apart each way and not more than three plants to a hill.

The yield has been calculated from two rows each, sixty-six feet long.

INDIAN CORN.—TEST OF VARIETIES.

Name of Variety.	Height.	When Tasselled.	In Silk.	Early Milk.	Late Milk.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
	Inc.						Tons.	Lbs.	Tons.	Lbs.
Mamm. 8-rowed Flint...	96	Aug. 16..	Sept. 10..	Sept. 20.	Oct. 14.	Late milk.	22	1,320	21	1,020
Thorobred White Flint..	90	" 18..	" 20..	Oct. 4.	....	Ea. milk..	22	220	16	1,180
White Cap Yellow Dent	108	" 22..	" 20..	" 4.	....	" ..	20	1,250	16	1,400
Early Mastodon.........	90	" 10..	" 16..	Sept. 24.	....	Roast. ear	20	700	15	360
Compton's Early	100	" 16..	" 20..	Oct. 1.	....	Ea. milk..	19	1,820	16	1,440
Mammoth Cuban	112	" 29..	" 20..	" 2.	....	" ..	17	320	16	780
King of the Earliest.....	112	" 14..	" 3..	Sept. 20.	Oct. 7.	L. milk...	16	1,660	15	690
Salzer's All Gold........	76	" 12..	" 1..	" 18.	Sept. 24.	Glazed....	15	1,680	17	210
" Superior Fodder.	106	" 28..	" 16..	Oct. 4.	....	Ea. milk.	15	1,570	13	1,060
Selected Leaming.......	106	" 28..	" 15..	" 8.	....	" ..	15	1,460	17	540
Pride of the North.......	108	Sept. 18..	Oct. 8..	....	....	Silk......	15	1,240	16	1,000
Champion White Pearl. .	108	" 6..	Sept. 29..	Oct. 10.	....	Ea. milk..	15	1,020	16	1,440
Extra Early Huron Dent	102	Aug. 23..	" 13..	Sept. 24.	Oct. 14.	L. milk...	15	800	13	950
Longfellow.............	96	" 10..	Aug. 26..	" 20.	" 8.	Glazed....	15	580	15	1,900
Early Butler...........	106	" 15..	" 30..	" 30.	....	Roast. ear	15	360	15	1,460
North Dakota White....	90	" 17..	" 30..	" 28.	Oct. 16.	L. milk...	15	360	13	1,940
Red Cob Ensilage..	112	Sept. 3..	Sept. 20..	Oct. 14.	....	Ea. milk..	14	380	16	1,770
Kendall's Early Giant...	84	Aug. 18..	Aug. 30..	Sept. 26.	Oct. 18.	L. milk...	13	1,610	7	280
Yellow Long Eared....	76	" 20..	Sept. 6..	" 16.	Sept. 28.	Glazed....	12	1,960	13	1,280
Cloud's Early Yellow...	108	" 28..	" 16..	" 28.	....	Ea. milk..	12	1,520	12	200
Giant Prolific Ensilage..	106	" 30..	" 17..	" 30.	....	" ..	12	1,410	12	1,080
Canada White Flint....	84	" 16..	Aug. 30..	" 22.	Oct. 14.	L. milk...	11	1,860	11	440
Evergreen Sugar........	90	" 18..	" 30..	Oct. 16.	....	Ea. milk..	11	1,430	10	130
Sanford................	100	" 14..	" 26..	Sept. 18.	Oct. 18.	L. milk...	10	1,780	13	1,060
Angel of Midnight..	84	" 22..	Sept. 18..	Oct. 10.	....	Ea. milk..	10	1,340	10	1,890
Pearce's Prolific.........	96	" 30..	" 16..	Sept. 30.	Oct. 18.	L. milk...	10	20	9	1,140
Country Gentleman.....	80	" 30..	" 26..	Oct. 16.	....	Ea. milk..	9	150	6	860
North Dakota Yellow...	48	" 15..	Aug. 30..	Sept. 14.	Oct. 6.	Glazed....	8	1,160	9	1,800
Black Mexican.....	80	" 24..	Sept. 10..	" 22.	" 11.	L. milk...	7	520	7	300
Salzer's Earliest Ripe ...	48	" 16..	Aug. 28..	" 10.	" 4.	Glazed....	5	1,440	4	800
Yellow Six Weeks	48	" 10..	" 20..	" 4.	" 16.	Ripe	5	560	4	1,240
Mitchell's Extra Early..	48	" 2..	" 12..	Aug. 28.	" 10.	"	5	340	5	450
Early August...........	50	July 29..	" 9..	" 24.	" 6.	"	5	120	4	1,240

CORN AT DIFFERENT DISTANCES APART IN THE ROWS.

The same varieties were used in this test as were used last season.

The plants were trimmed to six inches in the drill and to three strong plants in the hill. The yield, as in previous years, is usually the heaviest where the drills or rows are at the least distance. In each case four rows of each variety were planted and the yield computed from 66 feet of the two centre rows. The plots were all planted May 20.

CORN.—AT DIFFERENT DISTANCES APART.

Name of Variety.	Date Sown.	Distance apart in Rows.	Hills.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		Inches.	Inches.		Tons.	Lbs.	Tons.	Lbs.
Champion White Pearl....	May 20....	21	21	Early milk..	26	1,564	23	388
" "	" 20....	28	28	" ..	21	151	19	1,034
" "	" 20....	35	35	" ..	17	1,750	16	1,716
" "	" 20....	42	42	Late milk ..	14	838	13	400
Selected Leaming.........	" 20....	21	21	" ..	23	675	21	240
" "	" 20....	28	28	" ..	21	428	19	751
" "	" 20....	35	35	" ..	17	734	15	129
" "	" 20...	42	42	" ..	14	1,134	13	1,908
Longfellow	" 20....	21	21	....	14	1,735	15	171
"	" 20....	28	28	....	17	791	17	1,922
"	" 20....	35	35	....	14	285	13	249
"	" 20....	42	42	Late milk ..	13	195	12	1,958

EXPERIMENTS WITH TURNIPS.

Twenty-nine varieties of Turnips were tested. Two sowings of each sort were made, the first on May 28, and the second on June 11. All were pulled November 11. The soil was a clay loam, had been in cultivation since 1890, and had become fairly uniform. A good clover sod was turned under in spring of 1897, and another in spring of 1900, and a light dressing of stable manure given last winter which was thoroughly mixed with the soil before the seed was sown. The land was uniform and as will be seen, the yields are good.

The yields per acre have been calculated from the weight of crop gathered from two rows, each 66 feet long. The crop from the first sown plots gave a considerably higher average than that from the second sown.

TURNIPS.—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Emperor Swede	49	10	1,633	30	48	30	1,206	30
Magnum Bonum	48	1,020	1,670	..	38	1,220	1,287	..
Imperial Swede	47	380	1,573	..	42	1,140	1,419	..
East Lothian	46	1,720	1,562	..	39	540	1,309	..
Prize Purple Top	46	70	1,534	30	38	1,385	1,289	45
Hall's Westbury	45	420	1,507	..	42	1,470	1,424	30
Jumbo	45	255	1,504	15	38	1,220	1,289	45
Monarch	45	172	1,502	52	42	1,140	1,419	..
Elephant's Master	44	770	1,479	30	35	600	1,176	40
Marquis of Lorne	44	440	1,473	20	34	1,630	1,160	30
New Arctic	43	1,935	1,465	35	41	1,820	1,397	..
Skirvings	43	1,450	1,457	30	40	1,180	1,353	..
Drummond Purple Top	43	1,120	1,452	..	38	230	1,270	30
Prize Winner	43	460	1,441	..	42	1,140	1,419	..
Sutton's Champion	43	295	1,438	15	40	850	1,347	30
Carter's Elephant	42	1,305	1,421	45	42	480	1,408	..
Mammoth Clyde	41	1,820	1,397	..	39	540	1,309	..
Selected Champion	41	800	1,380	30	35	620	1,177	..
Kangaroo	40	1,840	1,364	..	45	1,080	1,584	40
Giant King	40	1,180	1,353	..	35	620	1,177	..
Hartley's Bronze	40	520	1,342	..	35	950	1,182	30
Champion Purple Top	40	350	1,339	15	39	530	1,325	30
Selected Purple Top	39	1,530	1,325	30	35	290	1,171	30
Bangholm Selected	38	1,220	1,287	..	42	1,140	1,419	..
Perfection Swede	38	1,055	1,284	15	38	230	1,270	30
Shamrock Purple Top	38	890	1,281	30	37	1,900	1,265	..
West Norfolk Purple Top	37	1,570	1,259	30	29	1,730	995	30
Halewood's Bronze Top	35	1,128	1,171	20	38	1,055	1,284	35
Webb's New Renown	34	1,960	1,166	..	38	65	1,267	45

EXPERIMENTS WITH MANGELS.

Twenty-four varieties of Mangels were tested this year. The soil was a loam mixed sandy and clay, and had only produced one crop since breaking up. After breaking up a good deal of levelling was necessary and as a consequence the condition was not uniform nor the stand even. Two plots of each variety were sown, the first on April 26, and the second on May 10. All were pulled on November 6. Four rows, each one hundred feet long, of each sort was sown at each sowing and the yield was computed from the two centre rows, each 66 feet long.

MANGELS.—TEST OF VARIETIES.

Name of Variety.	Yield per Acre.—1st Plot.		Yield per Acre.—1st Plot.		Yield per Acre.—2nd Plot.		Yield per Acre.—2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Giant Yellow Intermediate	26	120	902		23	530	775	30
Mamm. Yellow Intermediate	24	840	814		21	570	709	30
Lion Yellow Intermediate	22	1,000	750		20	95	668	15
Yellow Intermediate	21	1,065	717	25	19	610	643	30
Warden Orange Globe	20	920	682		19	940	649	
Prize Winner Orange Globe	20	460	674	20	14	1,865	497	40
Champion Yellow Globe	20	95	668	15	19	280	638	
Yellow Fleshed Tankard	19	1,930	665	30	17	320	572	
Norbiton Giant	19	1,600	660		17	1,640	594	
Selected Mamm. Long Red	19	1,435	657	15	21	240	704	
Mammoth Oval Shaped	19	775	646	15	21	590	709	50
Giant Yellow Globe	19	280	638		16	670	544	30
Half Long Sugar White	17	1,640	594		15	360	506	
Prize Mamm. Long Red	17	320	572		16	1,000	550	
Mammoth Long Red	16	1,660	561		16	1,990	566	
Gate Post	16	1,165	552	45	17	1,640	594	
Giant Yellow Half Long	16	1,085	551	35	17	1,475	591	15
Leviathan Long Red	16	835	547	15	15	690	511	30
Triumph	16	340	539		17	320	572	
Gate Post Yellow	15	1,020	517		13	400	440	
Half Long Sugar Rosy	15	360	506		14	1,700	495	
Golden Fleshed Tankard	13	730	445	30	17	980	583	
Canadian Giant	12	1,740	429		16	1,330	555	30
Ward's Large Oval Shaped	9	480	308		11	1,430	390	30

The seed of the Red Fleshed Tankard failed to germinate.

EXPERIMENTS WITH CARROTS.

Twenty varieties of carrots were tested this year. They were sown alongside of the mangels, and the soil and conditions were in every respect similar. Two plots of each sort were sown, in drills 2 feet apart, the first series of plots were sown April 25 and the second on May 9, and all pulled November 5. As in previous years the stump rooted sorts gave the best yield and are more desirable because easier to pull and less liable to break in handling. The yield is computed from 66 feet of the two centre rows in each plot.

SESSIONAL PAPER No. 16

CARROTS.—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Improved Short White	30	1,220	1,020	20	25	637	843	57
Iverson's Champion	30	720	1,012		30	390	1,006	30
Giant White Vosges	28	1,585	959	45	28	740	979	
Ontario Champion	28	100	935		26	1,130	885	30
Green Top White Orthe	27	1,440	924		28	1,585	959	45
Mamm. White Intermediate	27	1,110	918	30	25	1,974	866	14
Carter's Orange Giant	26	1,130	885	30	26	635	871	35
Yellow Intermediate	26	1,046	884	26	21	240	704	
Early Gem	26	800	880		21	1,548	725	48
New White Intermediate	25	1,263	854	23	26	140	869	
Half Long White	25	490	841	30	28	1,585	959	45
Long Yellow Stump Rooted	23	1,520	792		25	1,314	855	14
Scarlet Intermediate	23	1,468	791	8	21	240	704	
White Vosges, Large Short	21	1,230	720	30	24	1,500	825	
Half Long Chantenay	20	920	682		20	1,580	693	
Long Scarlet Altringham	20	590	676	30	19	1,930	665	30
White Belgian	19	1,765	662	45	24	1,181	819	41
Guerande or Ox-Heart	17	1,640	594		18	1,143	619	3
Long Orange or Surrey	14	1,040	484		13	1,720	462	
Scarlet Nantes	13	1,573	459	23	13	70	434	30

EXPERIMENTS WITH SUGAR BEETS.

Seven varieties of sugar beets were tested alongside of the carrots and mangels and under similar conditions. Two sowings were made of each sort, the first on April 26 and the second on May 10, and all were pulled November 6. The yields are not heavy and they have not been as profitable to raise for feeding here as mangels or carrots, because of the lighter yield and being more difficult to harvest. They are often rooty and the growth is nearly all underground. Four rows of each sort were sown and the yield computed from 66 feet of each of the two centre rows.

SUGAR BEETS.—TEST OF VARIETIES.

Name of Variety.	Yield per Acre. — 1st Plot.		Yield per Acre. — 1st Plot.		Yield per Acre. — 2nd Plot.		Yield per Acre. — 2nd Plot.	
	Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
Improved Imperial	16	1,990	566	30	13	1,720	462	10
Danish Red Top	16	1,330	555	30	17	980	583	
Royal Giant	16	1,165	552	45	17	816	580	16
Vilmorin's Improved	13	1,060	451		14	1,700	495	
Red Top Sugar	13	400	440		15	30	500	30
Danish Improved	11	441	374		12	420	407	
Wanzleben	9	480	308		9	150	302	30

EXPERIMENTS WITH POTATOES.

Ninety varieties of potatoes were planted, May 8 and 9, on clay loam, which had been given about twenty wagon loads per acre of barnyard manure in the spring of 1900. This had been worked well into the soil with spading-harrow and drag and a crop of oats grown that year. As soon as the oats were harvested the land was well harrowed to start weed seeds and shed grain and ploughed late in the fall. In spring it was well stirred and mixed by use of the spading-harrow and drag, and the potatoes planted in drills 2½ feet apart. The spring was wet and cold but the seed germinated well and the stand was even throughout. The yield is a very good one and the quality all that could be desired. Except a few rows left as check rows, all were sprayed with Bordeaux mixture to prevent injury by blight; but those untreated remained healthy until ripened as there was no blight this season. Four rows of each sort were planted and the yield per acre calculated from two centre rows, 66 feet long. There was very little rot this year and the crop throughout was very even and fine.

Potatoes.—Test of Varieties.

Name of Variety.	Total Yield per Acre.		Yield per Acre of Sound.		Yield per Acre of Rotten.		Yield per Acre of Marketable.		Yield per Acre of Unmarketable.		Form and Colour.
	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	
Uncle Sam	686	24	686	24	None	..	617	46	68	38	Round white.
Dakota Red	682		682		"	..	613	48	68	12	Long red.
Polaris	677	36	677	36	"	..	576		101	36	" white.
Vanier	675	24	675	24	"	..	573	46	101	38	" dark red.
Money Maker	673	12	673	12	"	..	605	52	67	20	" white.
Swiss Snowflake	673	12	673	12	"	..	605	52	67	20	Round "
American Giant	662	12	662	12	"	..	596		66	12	Long "
McIntyre	660		660		"	..	429		231		" pink.
Holborn Abundance	651	12	651	12	"	..	553	42	97	30	Round white.
Vick's Extra Early	633	36	633	36	"	..	506	56	126	40	" pale rose.
Bovee	629	12	629	12	"	..	534	50	94	22	Long rose.
New Variety No. 1	629	12	629	12	"	..	566	17	62	55	Round pale rose.
Seedling No. 230	624	48	624	48	"	..	468	36	156	12	" white.
Rochester Rose	622	36	622	36	"	..	497	47	124	52	Long rose.
Seedling No. 7	618	12	618	12	"	..	556	24	61	48	" red.
Northern Spy	616		616		"	..	492	48	123	12	" pink.
Lee's Favorite	614	54	614	54	"	..	522	40	92	14	" rose.
Hale's Champion	613	48	613	48	"	..	429	40	184	8	Round white.
Prize Taker	613	48	613	48	"	..	460	21	153	27	" red.
Clay Rose	613	48	613	48	"	..	552	26	61	22	Long rose.
Reeves' Rose	608	48	608	48	"	..	548		60	48	" "
Burnaby Seedling	607	12	607	12	"	..	546	20	60	42	" "
Flemish Beauty	606	12	606	12	"	..	424	24	181	48	" flat rose.
Empire State	594		594		"	..	475	12	118	48	" pink white.
Early Puritan	592	54	592	54	"	..	504	12	88	42	" white.
Columbus	589	36	589	36	"	..	501	11	88	25	" flat rose.
Carman No. 3	585	12	585	12	"	..	497	18	87	54	Oblong white.
Irish Daisy	580	48	580	48	"	..	348	28	232	20	Round white.
Quaker City	574	12	574	12	"	..	516	48	57	24	Flat "
Sabean's Elephant	569	48	569	48	"	..	484	21	85	27	" long white.
Daisy	558	48	558	48	"	..	391		167	48	Long pink and white.
Late Puritan	556	36	507		55	36	390		111		" "
Troy Seedling	554	24	554	24	None	..	471		83	24	" red.
I X L	553	18	553	18	"	..	470	24	82	54	" flat pink and white.
Green Mountain	553	18	553	18	"	..	470	18	83	..	Long flat white.
Brownell's Winner	547	48	547	48	"	..	465	39	82	9	" red.
Rose No. 9	545	36	545	36	"	..	490	36	55	..	" rose.
Delaware	543	24	543	24	"	..	489	24	54	..	Round white.
Houlton Rose	542	18	542	18	"	..	412	58	129	20	Long flat rose.
Carman No. 1	541	12	541	12	"	..	487	12	54	12	Round white.

POTATOES.—TEST OF VARIETIES—*Concluded.*

Name of Variety.	Total Yield per Acre. Bush.	Lbs.	Yield per Acre of Sound. Bush.	Lbs.	Yield per Acre of Rotten. Bush.	Lbs.	Yield per Acre of Marketable. Bush.	Lbs.	Yield per Acre of Unmarketable. Bush.	Lbs.	Form and Colour.
Seattle	541	12	541	12	None	...	432	57	108	15	Long round white.
General Gordon	537	54	537	54	"	.	403	26	134	28	" red.
Sharpe's Seedling	533	30	533	30	"	..	400	5	133	25	" round rose.
Brown's Rot Proof	533	30	533	30	"	..	426	48	106	42	" red.
Early Harvest	528		528	..	"	..	448	48	79	12	" white.
Cambridge Russet	525	48	525	48	"	..	420	48	105	..	" round russet.
American Wonder	523	36	523	36	"	..	418	48	104	48	" flat white.
New Queen	521	24	521	24	"	..	365		156	24	" round red.
State of Maine	519	12	519	12	"	..	415		104	12	" pink.
Beauty of Hebron	514	48	514	48	"	..	409		105	48	" white.
Lizzie's Pride	510	24	510	24	"	..	357	24	153	..	" red.
Country Gentleman	509	18	509	18	"	..	433	18	76	..	" pink and white.
Enormous	506		506	..	"	..	404	50	101	10	" white.
Wonder of the World	501	36	501	36	"	..	296	36	205	..	" rose.
Early Michigan	500	30	500	30	"	..	300	30	200	..	" white.
Rawdon Rose	484		484	..	"	..	445	36	48	24	" rose.
Maule's Thoroughbred	479	46	455	46	24	..	410	12	45	34	" "
Chicago Market	479	46	479	46	None	...	430	46	49	..	" red.
Everett	475	12	475	12	"	..	403	56	71	16	" round red.
Early Norther	475	12	475	12	"	..	402	50	72	22	" pink and white.
Early Andes	475	12	451	27	23	45	316		135	26	Round rose.
Canadian Beauty	470	48	470	48	None	...	423		47	48	Long flat rose.
Early St. George	448	58	426	32	22	26	384		42	32	" white.
Rural Blush	444	24	444	24	None	...	356	12	88	12	Round rose.
Maggie Murphy	440		440	..	"	..	358		66	..	Long rose.
Early Rose	437	48	437	48	"	..	307	48	130	..	" "
Thorburn	435	36	435	36	"	..	261	42	173	54	Oblong pink.
Bill Nye	431		431	..	"	..	301	20	129	40	" white.
Early White Prize	429	54	429	54	"	..	301	54	128	..	" "
Pride of the Market	430	39	430	39	"	..	376	15	64	24	Long flat white.
Up to Date	426	48	426	48	"	..	277	18	149	30	Oval white.
White Beauty	413	36	413	36	"	..	350	54	62	42	Long flat white.
Sutton's Invincible	400	34	400	34	"	..	342		58	24	" white.
Pearce's Prize Winner	400	34	400	34	"	..	260		140	34	" pink and white.
Burpee's Extra Early	398	12	398	12	"	..	238	56	159	16	" rose.
Earliest of All	396		396	..	"	..	277	12	118	48	Round white.
Early Sunrise	391	36	391	36	"	..	270	12	120	24	Long rose.
Prolific Rose	385	32	385	32	"	..	270		115	32	" "
Great Divide	371	48	371	48	"	..	223	6	148	42	Round white.
Sutton's Supreme	371	15	371	15	"	..	318	48	52	27	Long white.
Ohio Junior	365	12	365	12	"	..	219	12	146	..	" pink.
Clarke's No. 1	364	6	364	6	"	..	218	51	145	15	" "
Penn Manor	352		352	..	"	..	281	36	70	24	" red.
Rural No. 2	352		352	..	"	..	301		51	..	Oblong white.
Pearce's Extra Early	347	36	347	36	"	.	243	20	104	16	" rose.
Early Six Weeks	343	12	343	12	"	..	274	42	68	30	" pale rose.
Early Ohio	338	48	338	48	"	..	220	18	118	30	" dark rose.
Early Market	316	48	316	48	"	..	190	0	126	48	Oval rose.
Irish Cobbler	314	36	314	36	"	..	236		78	36	Round white.
Sir Walter Raleigh	312	24	312	24	"	..	218	40	93	44	Flat "

FODDER PLANTS.

The following fodder plants were tested this year. The ground was so cold and wet early in the season that there was a very poor stand in nearly every one of the millets, also in soja and horse beans and the subsequent growth has been poor. As in previous years the Japanese millet is the heaviest yielder, the foliage being very abundant and

the heads long and well filled while the stalks are not very coarse. All the plots of millet seeds were sown May 27.

Plot 1—Italian Millet :—

Length of stalk, 28 to 32 inches ; length of head, 4 to 5 inches ; yield when cut green, per acre, 3 tons 240 pounds.

Plot 2—Cat Tail Millet :—

Length of stalk, 30 to 32 inches ; length of head, 3½ to 4 inches ; yield per acre when cut green, 2 tons 1,680 pounds.

Plot 3—Early Algerian or Early Pearl Millet :—

Length of stalk, 30 to 32 inches ; length of head, 3 to 4 inches; yield per acre when cut green, 2 tons 1,280 pounds.

Plot 4—Moha Hungarian Millet :—

Length of stalk, 30 to 34 inches; length of head, 3 to 4 inches; yield per acre, cut green, 3 tons 720 pounds.

Plot 5—White Round Extra French Millet :—

Length of stalk, 20 to 24 inches; length of head, 2 to 3 inches; yield per acre when cut green, 2 tons 1,520 pounds.

Plot 6.—German or Golden Millet :—

Length of stalk, 24 to 26 inches; length of head, 3 to 4 inches; yield per acre when cut green, 3 tons 1,200 pounds.

Plot 7—Japanese Millet :—

Length of stalk, 40 to 44 inches; length of head, 4 to 6 inches; yield per acre when cut green, 4 tons 480 pounds.

Plot 8—Soja Beans, sown April 30 :—

Drills, 21 inches apart; length of stalk, 24 to 26 inches; very few pods formed; yield per acre when cut green, October 30, 2 tons 1,340 pounds.

Plot 9—Soja Beans, sown April 30 :—

Drills, 28 inches apart; length of stalk, 24 to 26 inches; not so many pods formed; yield per acre when cut green, 2 tons 1,920 pounds.

Plot 10—Soja Beans, sown April 30 :—

Drills, 35 inches apart; length of stalk, 24 to 26 inches; a few pods filled, but none ripened seed; yield per acre when cut green, 2 tons 640 pounds.

Plot 11—Horse Beans, sown April 30 :—

Drills 21 inches apart; length of stalk, 28 to 30 inches; very few pods formed and these were very short; yield per acre when cut green, 1 ton 440 pounds.

Plot 12—Horse Beans, sown April 30 :—

Drills 28 inches apart; length of stalk, 28 to 30 inches; very few pods and these not well filled; yield per acre when cut green, 1 ton 360 pounds.

Plot 13—Horse Beans, sown April 30 :—

Drills, 35 inches apart; length of stalk, 28 to 30 inches; a few short immature pods formed; yield per acre when cut green, 1 ton 640 pounds.

DWARF ESSEX RAPE.

Two plots were sown, one in drills, which was cultivated, the other was sown broadcast. Both plots were a comparative failure. The crop was cut and fed in September, and very little growth has been made up to the present time and no severe frosts have yet occurred.

SUNFLOWERS.

Two plots of sunflowers were sown May 11, one plot was sown in drills 30 inches apart and the other at 36 inches apart. The seed did not germinate well and the stand was scattered. The heads began to ripen early in September and as soon as the seed was well filled, in the earliest heads, the blue jays, robins and crows began to feed on them, and the best heads were destroyed before they were properly matured. There did not appear to be very much difference in the growth or size of the heads in either plot. The widest rows allowing more sunlight and air gave some ripened heads first, but the difference was not material and neither plot ripened at all evenly; some heads were fully ripened when others were only coming into bloom. On this account and because of the destruction of so much of the crop by the birds no accurate report can be made but as careful an estimate was made as was possible under the circumstances by counting the heads on a measured row, and weighing the seed from a number of average sized heads, and a conclusion reached that either plot would have produced about 1,200 pounds of clean seed per acre.

PASPALUM DILATATUM.

The plot of this grass from Australia which was reported on last year was winter-killed. There was nothing left this spring.

SAND VETCH.

This plant appears to be well adapted to this climate. The vines made a growth of over 5 feet, and blossomed freely, when cut the green crop weighed 8 tons 340 pounds; 1 ton 1,760 pounds cured. The horses and cattle do not care to eat it either cured or green.

MIXED GRAINS FOR FEED.

Several acres of mixed oats, pease and wheat were sown, part of it cut when the oats were in the dough and part left to ripen. The yield was good this year, curing a little over four tons of good feed per acre.

VEGETABLE GARDEN.

On account of the cold spring the vegetables and flower seeds sown in the garden made, as a rule, a poor stand and very slow growth. Those vegetables that require a rapid growth to produce the finest results, such as radish and lettuce, were rather poor.

LETTUCE.—Sown April 23.

Variety.	Fit for Use.	Remarks.
Forcing Milly	May 22	Leaves small; poor.
White Tennisball	" 26	Crisp and good.
Wheeler's Tom Thumb	" 22	Only medium.
Red-edged Victoria	" 29	Good.
Algiers	June 8	Crisp.
All the Year Round (black seed)	" 10	Crisp and sweet.
All the Year Round (white seed)	" 10	"
White Marvel of Cazard	" 16	White; crisp and tender.
Blond Stonehead	" 16	Large; medium.
Brown Stonehead	" 16	" crisp and sweet.
Early Ohio or Nonpareil	" 8	Medium.
Neapolitan	" 19	Crisp and good.
Marvel or Red Besson	" 20	Crisp, sweet, good.
Trocadero Red-edged or Big Boston	" 20	Very good.
Hammersmith	" 20	Only medium.
Hardy Red Winter	" 14	Leathery.
Green Paris Cos	" 18	Very fine.
White Paris Cos	" 18	Crisp and good.
Balloon	" 20	"
Trianon	" 20	"

CARROTS.—Sown April 17.

Parisian Forcing	July 11	Very fine quality.
French Horn	" 22	Very sweet; good.
Luc Half Long	" 28	Fine crisp; sweet.
Long Blood Red	Aug. 20	Very good.

CAULIFLOWER.—Sown in hotbed March 29; transplanted June 1

Early Snowball	July 27	Heads firm; good.
Extra Early Paris	" 24	" "
Extra Selected Earliest Dwarf Erfurt	Aug. 8	Heads small; firm.
Half Early Paris	" 14	Heads firm; good; large.
Chambourcy Mammoth	" 20	Heads large; open; poor.
Large Algiers	Sept. 6	Heads open; poor.
Autumn Giant	" 20	Heads solid; good.

CABBAGE.—Sown in hotbed March 29; transplanted May 30 and 31.

Express	Aug. 10	Heads small; firm; fair quality.
Paris Market	" 16	" " good.
Flat Parisian	" 22	" soft and small.
Very Early Etampes	" 18	" small; soft; poor.
Early Jersey Wakefield	" 18	" medium; firm; solid.
Extra Early Mid-summer Savoy	" 24	" " very solid; good.
Early Winningstadt	" 30	" large; solid; very good.
Drumhead St. John's Day	Sept. 14	" " very regular heads.
Fottler's Improved Brunswick	" 14	" " " "
Red Large Drumhead	" 20	Large and very solid heads.
Red Polish Shortstem	" 20	Medium size "
Green Globe Savoy	" 20	" " "

BRUSSELS SPROUTS.—Sown in hotbed March 29; transplanted May 30.

Half Dwarf Paris Market	Oct. 10	Did not grow well.
Dwarf Improved	" 20	Very poor.

BROCOLI.—Sown in hotbed March 29; transplanted May 30.

Variety.	Fit for Use.	Remarks.
Extra Early White	Oct. 6	Heads small; open.
Large White Mammoth	" 20	" medium.

BEETS.—Sown April 17; fit for table July 6.

Egyptian	July 6	A quick grower; fine flavour.
Nutting's Dwarf Improved	" 9	" " " good colour.
Early Blood Red Turnip	" 16	" " " "
Long Smooth Blood Red	Aug. 8	Smooth: slender; dark red; good.
Dell's Black Leaf	" 12	" " " very fair.

TABLE TURNIPS.—Sown April 17. A fine even stand in all these turnips.

Extra Early White Milan	June 13	Crisp; sweet; pleasant; good size.
Early White Strap Leaved	" 17	" " " " flavour.
Half Long Early White Vertus	" 17	Medium grower; poor quality.
Early Stone	" 24	Crisp; solid; fine quality
Yellow Robertson's Golden Ball	" 24	" rich; fine quality and flavour.

RADISHES.—Sown April 16. Fit for table June 1.

Forcing Turnip Scarlet	June 1	Crisp; sweet.
Forcing Scarlet White Tipped	" 1	" good.
Forcing Deep Scarlet	" 1	Crisp; good; sweet.
Forcing Deep Scarlet Shortleaf	" 1	Medium crisp.
Forcing White	" 6	Crisp; juicy.
Early Scarlet Turnip	" 8	" " pleasant.
Early Scarlet White Tipped Turnip	" 8	" " very good.
Deep Scarlet Turnip	" 14	" good.
Very Early Yellow Turnip	" 6	Not crisp; a little tough.
Olive Shaped Scarlet	" 14	Tough and stringy.
Olive Shaped Scarlet White Tipped	" 20	Medium crisp; pleasant.

WINTER RADISH.—Sown June 16; pulled November 10.

Winter Russian, large, crisp, fine flavour.
Winter Black Long Spanish, large, sweet, crisp, good.
Winter Scarlet China, medium large, crisp, sweet.

BEANS.—Planted April 17.

Variety.	Fit for Table.	Remarks.
King of the Wax Beans	July 11	Vines small, not productive; pods 2 to 3 inches long crisp, good flavour; ripe Sept. 4.
Fame of Vitry	" 22	A moderate grower, productive; pods 4 to 6 inches long, crisp, good; ripe Sept. 8.
Dwarf, Emperor of Russia	" 26	A medium grower, productive; pods 3 to 5 inches long, crisp, fine flavoured; ripe Sept. 11.
Dwarf, Golden	" 26	A strong grower and productive; pods 3 to 4½ inches long, crisp, fine quality; ripe Sept. 8.
French Dwarf, Extra Early	" 24	Vines short, not productive; pods 3 to 4 inches long, good flavour; ripe Sept. 11.
Flageolet, Black Speckled	" 24	A medium grower and productive; pods 3½ to 5 inches long, crisp, pleasant flavour; ripe Sept. 24.
Canadian Wonder	" 21	Vigorous grower and productive; pods 4 to 6 inches long, plump, crisp, good flavour; ripe Oct. 4.

TABLE CORN.—Planted May 22.

Variety.	Fit for Table.	Remarks.
Early White Cory	Sept. 15	Ears 6 inches long, well filled ; good quality.
Early Crosby Sugar	October 22	Ears short, not well filled ; good quality.
Stowell's Evergreen	" 30	Good ears, well filled but very late.
Perry's Hybrid	" 30	Ears short and only in early milk when cut.
New Champion Sugar	" 23	Ears short and poor ; a poor variety.
Nonsuch Sugar	....	Early milk when cut, Nov. 3.
Country Gentleman		" " "
Pop Corn		Stalks 5 feet high and 2 to 3 ears of 6 inches long on each stalk.

CELERY.—Sown in hotbed, March 29 ; transplanted to garden June 4.

Variety.	Fit for Use.	Remarks.
Rose Ribbed Paris	Sept. 4	Poor flavour.
Paris Golden Yellow	October 1	Good quality.
Giant Pascal	" 13	Coarse and stringy.
Red Large Ribbed	" 10	Coarse and poor.

GARDEN PEASE.—Sown May 18.

Variety.	Fit for Table.	Size of Pea.	Length of Pod.	Remarks.
			Ins.	
American Wonder	June 16	Medium	2¼	Vines well loaded ; good quality.
Alaska	" 21	Small	2	" " "
Nott's Excelsior	" 21	"	2½	" " "
McLean's Advance	July 2	Medium	2½	Not well loaded ; fair quality.
Pride of the Market	" 6	Large	3½	Vines well podded ; good flavour.
Admiral	" 14	Small	3½	A medium crop ; fair quality.
Duke of Albany	" 10	Large	3½	Well loaded ; extra fine quality.
Shropshire Hero	" 12	Medium	4	" good quality.
Telephone	" 10	Large	4	Medium crop ; "
Stratagem	" 12	"	3½	" "
New Dwarf, Telephone	" 15	"	4	Well podded ; "
Heroine	" 16	"	4	" "
Champion of England	" 20	"	3	Medium crop ; "
Gradus	" 21	"	3	" "

ONIONS.—Sown April 13.

Variety.	Remarks.
James Keeping	Very few of the seeds germinated ; no crop.
White Dutch	" " " a few small onions.
Weathersfield Large Red	The only one that made bottoms ; 110 bush. per acre.
Blood Red	A few bottoms, but most of the poor crop was necks.
Market Favourite Keeping	Very few bottoms ; a few small soft onions.
Danvers Yellow Globe	Seed grew well, but the crop failed to bottom.
Trebon's Large Yellow	Seed failed to grow ; no crop.
Straw Coloured White Spanish	Seed grew well, but roots very small ; no bottoms.
Paris Silverskin	Very few onions, but a good sample of the sort.

SQUASH.—Planted May 1.

Variety.	Fit for Use.	Remarks.
Summer Crookneck	August 15	Vines not productive; squash small and watery.
Early White Scallop	" 13	Not productive; quality good; flavour good.
The Warren	" 10	Vines vigorous and moderately productive; largest squash 11 lbs.; flesh thick, rich, yellow, dry and good.
Extra Early Orange	" 16	Vines vigorous and productive; flesh thick, rich, yellow and very fine flavour; largest squash 9½ lbs.
Hubbard	Sept. 1	Vines vigorous and medium productive; flesh thick, rich, dry and good; heaviest squash 11¾ lbs.
Faxon	" 6	Vines vigorous but not productive; not high quality; largest squash 15½ lbs.
Mammoth Chili	October —	Vines very vigorous and productive; too coarse for table use; largest squash 43 lbs.
Perfect Gem	August 20	Vines very vigorous and productive; quality good; largest squash 6 inches in diameter.

PUMPKINS.—Planted May 2.

Variety.	Remarks.
Mammoth Tom	Vines very vigorous and productive; pumpkins large, oblong, heavy.
Quaker Pie	Vines medium, vigorous and only moderately productive; fruit medium or below in size, round, flattened, good quality.
Winter Luxury	Vines very vigorous and productive; fruit small, orange yellow round, of good quality; fit for use August 10.
Golden Marrow	Vines vigorous and productive; fruit large, golden orange, flesh deep, fine quality; ripe August 20.
Large Cheese	Vines medium growers, vigorous, not productive; fruit large, very thick fleshed, fair quality; fit for use August 30.
Calhoun	Vines medium in vigour and productiveness; flesh very thick, but cracks late in the season; ripe September 20.

DISTRIBUTION OF SEED SAMPLES.

This branch of the work is increasing rapidly and the interest shown in it is good evidence that those who take care to save the produce of the samples received are in many instances benefited.

In a province of such area and great diversity of climate as British Columbia many samples are not a success, but many are, and where one sample proves successful the grower is soon able to supply neighbours with seed.

One farmer reports 740 lbs. of potatoes from a three lb. sample of American Wonder, and from 130 lbs. to 200 lbs. was quite a common return from a 3-lb. sample this year.

Packages of scions	241
Packages of nuts	97
Packages of small fruit	131
3 lb. samples potatoes	259
3 lb. samples pease	87
3 lb. samples oats	246
3 lb. samples barley	184
3 lb. samples wheat	168

The correspondence of the farm is increasing, the number of letters received this year was 2,518, and the answers sent out 2,378

APPLES.

Wet weather was almost continuous with cold north winds and occasional light frosts during the blossoming period, and this was no doubt the cause of a comparative failure in all the tree fruits this year.

Fruit trees of all sorts bloomed very profusely and having made a vigorous growth last year should if the weather had been favourable, have given a heavy crop of all sorts.

In the following notes will be found short descriptions of those varieties which fruited this year for the first time :

Lord Suffield.—Tree a very vigorous grower and an early bearer. Fruit medium to large, smoothly conical. Skin light yellow, with a pale blush, flesh whitish, soft, rather coarse, mildly acid. Season August.

Early Rivers.—Tree a medium grower and an early producer. Fruit large, oblong and tapering to the eye. Skin yellowish white. Flesh white, soft, rather coarse; sprightly acid, juicy. Season August.

Domino.—Tree a medium grower and an early bearer. Fruit above medium size, globular tapering slightly to the eye. Skin yellowish white, with a pink blush. Season August.

Red Summer Peach.—Tree a strong grower. Fruit of medium size round, tapering to the eye ; skin golden yellow, nearly covered with bright red. Flesh soft, crisp, white, mildly acid, with a pleasant flavour. Season August.

Beautiful Arkad.—Tree a strong and healthy grower. Fruit of medium size, oblong, conical ; skin clear golden yellow, with a pale reddish blush. Flesh white, crisp, juicy, with a pleasant flavour, mildly acid. Season August.

Lubsk Queen.—Tree a strong grower. Fruit large, oblong, conical ; skin yellowish, nearly covered with splashes of bright red and a thin whitish bloom. Flesh white, crisp, juicy, mildly sub-acid, or nearly sweet. Season August.

Madam Niemetz.—Tree a vigorous grower. Fruit of medium size, round, flat; skin green, streaked with dull red. Flesh greenish white, firm, juicy, mildly sub-acid, with a pleasant flavour. Season August.

Taarenborg.—Tree a vigorous open spreading grower. Fruit of medium size ; skin greenish yellow, with a pale blush on sunny side. Flesh white, a little coarse, juicy, crisp, mildly acid, with a pleasant flavour. Season August.

Red Pigeon.—Tree a vigorous grower and an early bearer. Fruit of medium size, conical ; skin yellow, striped and splashed with two shades of red. Flesh white, crisp, moderately juicy, mildly acid, with a pleasant flavor. Season August.

Orange.—Tree a medium grower. Fruit of medium size, flattish, tapering a little to the eye; skin greenish yellow, with a faint, dull red blush. Flesh white, soft, juicy, sub-acid. Season August.

Red Summer Calville.—Tree a medium grower. Fruit small, conical, inclined to scab ; skin greenish yellow with stripes of dull red, flesh greenish white, soft, juicy, with a pleasant flavour; sub-acid. Season August.

Drap d'Or.—Tree a moderate grower. Fruit above medium size, roundish, oblate ; skin dull greenish yellow with numerous small brown dots. Flesh yellowish, crisp, moderately juicy and mildly acid. Season August.

Gold Prince.—Tree a vigorous grower. Fruit large, oblong, tapering slightly to eye ; skin whitish golden, striped with bright clear red. Flesh yellowish, tender, mildly sub-acid ; not juicy. Season August.

Transparent de Croncelles.—Tree a strong grower and early bearer. Fruit large globular ; skin yellowish white, with a pink flush on sunny side. Flesh coarse, yellowish, moderately juicy and mildly acid. Season August.

Cove.—Tree a moderate grower. Fruit of medium size, oblate ; skin green, nearly covered with dull red, and small patches of russet. Flesh white, tender, with a pleasant flavour, mildly acid. Season August.

Striped July.—Tree a slow grower. Fruit of medium size, conical ; skin yellow, freely splashed and striped with red. Flesh white, juicy, tender, with a pleasant flavour sub-acid. Season August.

Early Joe.—Tree a slow grower. Fruit small, oblate, tapering a little to eye ; skin greenish yellow, splashed with red. Flesh white, crisp, fine grained, of a pleasant flavour, mildly acid. Season August.

Sylvan Sweet.—Tree a medium grower and an early bearer. Fruit small, roundish, oblate ; skin yellow nearly covered with bright red ; flesh yellowish, crisp, not juicy, but sweet, with a pleasant flavour. Season August.

White Transparent.—Tree a vigorous grower. Fruit of medium size, roundish, conical; skin dull yellow, with stripes and splashes of pale red. Flesh white, soft moderately juicy ; mildly sub-acid, with a pleasant flavour. Season August.

Moscow.—Tree a slow grower. Fruit of medium size, roundish ; skin greenish yellow, with a dull red cheek. Flesh white, juicy, soft, mildly sub-acid, with a pleasant flavour. Season August.

Raspberry.—Tree a moderate grower. Fruit of medium size, conical ; skin golden yellow, striped and splashed with bright red. Flesh white, crisp, tender, juicy, mildly sub-acid, with a pleasant flavour. Season August.

Late Duchess.—Tree a medium grower. Fruit small, oblong, conical ; skin yellowish white, lightly striped with red. Flesh yellowish, moderately juicy, soft, tender, sweet. Season August.

Early Ripe.—Tree a vigorous grower. Fruit of medium size, roundish, conical, skin greenish yellow, with a pale reddish blush. Flesh white, crisp, moderately juicy, mildly acid, with a pleasant flavour. Season August.

Colton.—Tree a vigorous grower and an early bearer. Fruit of medium size, oblong, conical ; skin yellow with a purple flush nearly over the whole surface. Flesh white, firm, juicy, sub-acid, with a good flavour. Season early October.

Hibernal.—Tree a vigorous and healthy grower. Fruit large, conical ; skin greenish with a red cheek. Flesh white, crisp, juicy, a little coarse, mildly acid. Season September.

Early Golden Margaret.—Tree a medium grower. Fruit of medium size, oblong, conical ; skin yellowish white. Flesh yellowish, firm, crisp, juicy, with a pleasant flavour and mildly acid. Season September.

Marseilles Summer.—Tree a medium grower. Fruit of medium size, conical ; skin yellow, with a reddish blush on the sunny side. Flesh white, moderately juicy, crisp, mildly acid, with a pleasant flavour. Season September.

Cousinot Purple Red.—Tree a free grower. Fruit small to medium, oblong conical ; skin green with streaks and splashes of dull red. Flesh white, crisp, firm, moderately acid. Season October.

Autumn Short Stem.—Tree a poor grower. Fruit small, round, flattened ; skin greenish with many whitish dots and a faint reddish blush on the sunny side. Flesh greenish white, juicy, crisp, mildly acid, with a pleasant flavour. Season September.

Langtons.—Tree a strong grower and an early bearer. Fruit of medium size, globular, slightly flattened at stem and calyx ; skin yellowish green, splashed with two shades of red and many white dots, and with a little russet about the stem. Flesh white, firm, juicy, fine grained, mildly acid with a pleasant flavour. Season early September.

Peasgoods Golden Reinette.—Tree a vigorous grower and an early bearer. Fruit of medium size, conical ; skin smooth golden yellow, with a red cheek. Flesh yellowish, juicy, crisp, mildly acid, with a pleasant flavour. Season October.

Bostic Queen.—Tree a medium grower. Fruit of medium size, oblate, conical, skin green with a dull red cheek and many grey dots. Flesh yellowish, firm, juicy, mildly sub-acid with a pleasant flavour. Season October.

Barloff.—Tree a strong grower. Fruit small, conical ; skin green with a dull red cheek. Flesh white, moderately juicy, mildly acid, with a pleasant flavour. Season October.

Orleans Reinette.—Tree a medium grower and an early bearer. Fruit small to medium, conical; skin greenish yellow, with a little russet about the stem, and a reddish blush on the cheek. Flesh white, firm, crisp, juicy, sprightly acid. Season October.

Harvest Reinette.—Tree a medium grower. Fruit of medium size, oblong, tapering a little to the eye ; skin greenish russet, with a little bronzy blush. Flesh white, firm, juicy, mildly acid, with a pleasant flavour. Season October.

Staar.—Tree a strong grower. Fruit of medium size, oblate ; skin greenish yellow, with many grey dots. Flesh white, crisp, juicy, sprightly, with a pleasant flavour. Season October.

Gideon's No. 30.—Tree a vigorous grower. Fruit above medium size, oblate, handsome ; skin greenish yellow, striped and splashed with bright red. Flesh white, crisp, juicy, mildly acid, is liable to rot at the core. Season October.

Painted Lady.—Tree a medium grower. Fruit above medium size, conical ; skin, greenish white with a dull red cheek, sprinkled with white dots, and covered with a thin whitish bloom. Flesh yellowish white, firm, moderately juicy, coarse grained, mildly acid with a pleasant flavour. Season October.

Golden Noble.—Tree a medium grower. Fruit above medium size, oblate ; skin greenish yellow, sprinkled with many whitish dots. Flesh white, juicy, firm, mildly sub-acid, with a pleasant flavour. Season October.

Landsburg Reinette.—Tree a strong grower. Fruit medium size, irregular, conical, rather knotty; skin green with patches of russet about the stem. Flesh white, moderately juicy, firm, sub-acid, inclined to water core and spoil before fully ripe. Season October.

Dr. Seelig's Orange.—Tree a strong grower. Fruit of medium size, globular tapering a little to the eye; skin greenish yellow. Flesh white, firm, juicy, sprightly not high flavoured, is liable to water core. Season October.

Enormous.—Tree a strong and spreading grower. Fruit medium to large, obtuse, conical, irregular in size and shape ; skin dull yellow, with a little russet about the stem. Flesh yellowish white, coarse granular, moderately juicy, sub-acid. Season October.

Thompson's Seedling, No. 66.—Tree a strong, spreading grower. Fruit of medium size, oblate, slightly conical ; skin green, nearly covered with orange and splashed with bright red. Flesh yellowish white, firm, crisp, fine grained, with a pleasant flavour. Season October.

Thompson's Seedling, No. 46.—Tree a strong grower. Fruit medium to above medium size, oblate ; skin greenish yellow, shaded with dull red and having a sprinkling of gray dots. Flesh white, fine grained, juicy, sprightly, with a fine and pleasant flavour. Season October.

Thompson's Seedling, No. 24.—Tree a vigorous grower. Fruit of medium size, conical. Skin yellowish green, with a red blush. Flesh white, juicy, crisp, sub-acid, with a pleasant flavour. Season October.

Colfax.—Tree a strong grower and an early bearer. Fruit above medium size, oblong, globular ; skin yellowish green, nearly covered with deep red. Flesh crisp, juicy, sub-acid, with a pleasant flavour. Season October.

Filippa.—Tree a medium grower. Fruit of medium size, oblong; skin yellow, with an orange reddish cheek, and many russet dots. Flesh white, tender, fine grained, mildly acid, with a fine pleasant flavour. Season October.

Henzen's Pearmain.—Tree a strong grower. Fruit of medium size, roundish globular ; skin green, nearly covered with dull red. Flesh white, crisp, mildly acid, moderately juicy, with a pleasant flavour. Season October.

The Queen.—Tree a moderate grower and an early bearer. Fruit large, oblate ; skin greenish yellow, splashed and streaked with bright red. Flesh white, firm, juicy, crisp, with a good flavour ; mildly acid. Season October.

Cellini.—Tree a fair grower and free producer. Fruit of medium size, oblong, slightly conical ; skin greenish yellow, nearly overspread with deep red. Flesh white, crisp, juicy, often stained with red, mildly acid, with a pleasant flavour. Season October and November.

Arnold's Beauty.—Tree a strong and upright grower. Fruit of medium size, oblate, tapering slightly to eye; skin clear yellow, with a bright red cheek. Flesh yellowish, fine grained, juicy, mildly sub-acid, with a pleasant aromatic flavour. Season October and November.

Pioneer.—Tree a moderate grower. Fruit of medium size, round, flattened at the ends; skin yellow, with a light red cheek. Flesh yellowish, tender, juicy, sub-acid, with a pleasant flavour. Season October and November.

Orange Pippin.—Tree a vigorous grower. Fruit of medium size, oblate ; skin greenish yellow, with a few white dots. Flesh yellowish white, juicy, tender, fine grained, mildly acid, with a pleasant flavour. Season October and November.

Golden Ball.—Tree a strong grower. Fruit of medium size, conical, skin yellow with patches of russet about the stem. Flesh yellow, firm, fine grained, juicy, sub-acid, with a pleasant flavour. Season November.

Early Almond.—Tree a strong grower and an early bearer. Fruit of medium size, round. Skin yellow striped and splashed over nearly the whole surface with light and dark red. Flesh white, firm, juicy, fine grained, mildly acid with a pleasant flavour. Season November.

Sanspareil.—Tree a vigorous grower and an early bearer. Fruit of medium or below medium size, oblong, ribbed. Skin yellowish-green with a reddish tint, and a few small streaks of red on the sunny side, Flesh white, firm, juicy, mildly sub-acid. Season October and November.

Claudius.—Tree a vigorous grower. Fruit small, round, flattened. Skin greenish-yellow. Flesh whitish, firm, juicy, sub-acid with a pleasant flavour. Season November and December.

Green Reinette.—Tree a medium grower and an early bearer. Fruit small, conical. Skin nearly covered with a dull reddish russet. Flesh greenish-white, firm, juicy sub-acid. Season November and December.

Red Reinette.—Tree a free grower. Fruit above medium size, oblong, conical, skin greenish-yellow, with a purple red cheek on the sunny side, and sprinkled with white dots, a handsome fruit. Flesh yellowish, juicy, firm, fine grained, mildly acid with a pleasant flavour. Season November and December.

Cossenza.—Tree a strong grower and an early bearer. Fruit small globular ; skin greenish-yellow, with patches of russet. Flesh yellowish, firm, moderately juicy, sweet, with a pleasant flavour. Season November and December.

Marie.—Tree a medium grower. Fruit of medium size, roundish oblong ; skin green, splashed on the sunny side with streaks of bright red. Flesh white, firm, juicy, sub-acid. Season December.

Ildrod Pigeon.—Tree a medium grower. Fruit small, conical; skin green, with a dull red cheek and a few gray dots. Flesh white, juicy, fine-grained, mildly acid, with a fine pleasant flavour. Season November and December.

Cranberry Seedling.—Tree a strong and upright grower, but slow in coming into bearing. Fruit small, roundish, conical ; skin yellow, with sometimes a faint blush and a few whitish dots. Flesh white, firm, medium juicy, sweet, with a pleasant aromatic flavour. Season November and December.

Muscat Reinette.—Tree a vigorous grower and an early bearer. Fruit of medium size, oblate, tapering slightly to the eye ; skin yellow, covered with a reddish-russet, and splashed with deep red. Flesh yellowish, firm, juicy, mildly acid, with a fine pleasant flavour. Season December.

Ewalt.—Tree a strong grower and an early bearer. Fruit large, roundish, conic; skin bright yellow with a blush on the sunny side. Flesh white, tender, juicy, sprightly, with a good flavour. Season December.

McKinley.—Tree a vigorous grower and an early producer. Fruit below medium size, roundish flattened, skin greenish-yellow, nearly covered with dull red. Flesh white crisp, fine grained, juicy, mildly acid, with a pleasant flavour. Season December.

Forest.—Tree a slow grower and a poor bearer. Fruit of medium size, oblong conical, ribbed, skin yellow nearly covered with dull red and sprinkled with gray dots. Flesh yellow, crisp, nearly sweet, juicy with a pleasant, somewhat aromatic flavour. Season December.

Barton's Favourite.—Tree a vigorous grower and an early producer. Fruit small, conical, skin green, nearly covered with dull red and sprinkled with white dots. Flesh white, firm, juicy, sub-acid. Liable to be scabby. Season December.

Red Eiser.—Tree a strong grower. Fruit of medium size, conical, skin green with a deep red blush on the sunny side, and many white dots. Flesh greenish white, firm, fine grained, spicy, good. Season December.

Dutch Golden Pippin.—Tree a moderate grower. Fruit below medium size, globular, skin dull greenish-yellow. Flesh yellowish white, firm, fine grained, juicy with a pleasant flavour. Season December and January.

Little Red Winter.—Tree a slow and slender grower. Fruit below medium size, oblate conical, skin greenish-yellow striped and splashed with red. Flesh firm, white, juicy, mildly acid with a pleasant flavour. Season December.

Zuzoff Winter.—Tree a medium grower. Fruit of medium size, oblong, tapering a little to the eye; skin green, nearly covered with dull purple red, and scabby. Flesh white, juicy, firm, sprightly. Season December.

Virginia Queen.—Tree a slow grower. Fruit small, conical; skin green, nearly covered with bright purple red. Flesh greenish, firm, moderately juicy, mildly acid. Season December.

Rudolph's Borsdorfer.—Tree a medium grower. Fruit small, round, flattened; skin greenish-yellow, with a faint blush. Flesh white, juicy, crisp, sub-acid, with a pleasant flavour. Season December.

Shirk.—Tree a strong grower. Fruit of medium size, conical; skin green, with a small red cheek on the sunny side. Flesh white, juicy, fine grained, mildly acid, with a pleasant flavour. Season December.

Windsor Chief.—Tree a medium grower. Fruit large, globular, ribbed, and slightly conical; skin green, nearly covered with dull red and sprinkled with whitish dots. Flesh greenish-white, firm and juicy, with a pleasant flavour; nearly sweet. Season December.

Bloomless.—Tree a medium grower. Fruit below medium in size, globular; skin greenish-white, with a few small patches of dull red and a whitish bloom. Flesh firm, white, juicy, fine grained, sweet with a pleasant flavour. Season December.

Golden Winter Pearmain.—Tree a vigorous grower and an early bearer. Fruit of medium size, conical; skin orange-russet, with a little red on the sunny side. Flesh juicy, yellowish-white, firm, sub-acid and of fine flavour. Season December.

New English Pigeon.—Tree a strong grower. Fruit below medium size, conical; skin green, nearly overspread with dull red. Flesh white, juicy and sprightly. Season December.

Seaton House.—Tree a vigorous grower, and an early bearer. Fruit of medium size, oblate, tapering to the eye; skin clear golden yellow, with streaks of light and dark red. Flesh yellowish, firm, moderately juicy, sub-acid, with a pleasant flavour. Season December and January.

Golden Queen.—Tree a strong grower and an early bearer. Fruit of medium size, oblong, conical irregularly ribbed; skin yellow with an orange red cheek, and a few greenish dots. Flesh whitish, firm, juicy, mildly acid, with a pleasant flavour. Season December.

Gill's Beauty.—Tree a moderate grower. Fruit large, globular, tapering a little to the eye; skin green, striped and splashed with red. Flesh white, firm, moderately juicy, mildly acid, with a pleasant flavour. Season December.

Pickard's Reserve.—Tree a medium grower. Fruit of medium size, oblate; skin a russet yellow, with a small red blush on sunny side, and a few gray dots. Flesh juicy, yellowish, firm, sub-acid, with a pleasant aromatic flavour. Season December.

Harrison.—Tree a strong grower and an early bearer. Fruit of medium size, globular, tapering a little to the eye; skin greenish-yellow, with a small red blush in the sun. Flesh white, moderately juicy, firm, mildly acid. Season winter.

Oberdick's Pearmain.—Tree a medium grower. Fruit of medium size, oblong, globular, tapering a little to the eye; skin green with a dull red cheek and a few splashes of brighter red. Flesh white, firm, juicy, sub-acid, with a fine spicy flavour. Season winter.

Deak's Winter Calville.—Tree a strong grower. Fruit large, conical, deeply ribbed; skin greenish-yellow with a few whitish dots. Flesh white, firm, juicy, mildly acid, pleasant flavour. Season winter.

Steednicne.—Tree a vigorous grower. Fruit small, conical; skin greenish-yellow. Flesh white, firm, juicy, sub-acid, with a pleasant flavour. Season winter.

Flintinge.—Tree a strong grower. Fruit of medium size, oblong, conical; skin yellow, with a red cheek and small stripes of light red. Flesh yellowish, juicy, firm, fine-grained, with a pleasant flavour. Season winter.

Boiken.—Tree a strong grower. Fruit of medium size, irregularly ribbed, conical; skin greenish with a red cheek and many white dots. Flesh white, firm, juicy, mildly acid with a pleasant flavour. Season winter.

Red Winter Sweet.—Tree a medium grower. Fruit of medium size, round conical; skin greenish-yellow, with streaks and patches of bright red. Flesh yellowish, a little coarse, moderately juicy, very sweet. Season winter.

Martha Washington.—Tree a strong grower. Fruit of medium size, oblong, globular; skin yellowish green, with a few patches of dull red. Flesh greenish-white, juicy, mildly acid, with a pleasant flavour. Season winter.

Allen's Russet.—Tree a strong grower. Fruit small, conical; skin grayish-russet, with a blush on the sunny side. Flesh white, crisp, juicy, mildly acid, with a pleasant flavour. Season winter.

Springdale.—Tree a strong grower. Fruit small, globular; skin green, nearly overspread with dull purple, and sprinkled with gray dots. Flesh greenish white, firm, juicy, mildly acid, inclined to scab. Season winter.

Bright Water.—Tree a strong grower. Fruit of medium size, conical; skin green, with large patches of russet and a red blush on the sunny side. Flesh white, firm, moderately juicy, nearly sweet. Season winter.

Aiken.—Tree a vigorous grower. Fruit of medium size, globular; skin green, with a red cheek and stripes of red over nearly the whole surface. Flesh yellowish-white, juicy, rather acid. Season winter.

Yates Winter.—Tree a vigorous grower. Fruit small, conical; skin green with a few stripes of red and many white dots, and a thin whitish bloom. Flesh greenish white, firm, juicy, mildly acid, with a pleasant flavour. Season winter.

Court Pendu Royal.—Tree a vigorous grower. Fruit of medium size, flat; skin greenish-yellow, nearly covered with deep red. Flesh yellowish, crisp, moderately juicy, sprightly acid. Season winter.

Pomme Grise.—Tree a slender medium grower. Fruit small, roundish, oblate; skin greenish gray, with russet and a small blush in the sun. Flesh white, tender, moderately juicy, with a rich flavour. Season winter.

Wandering Spy.—Tree a strong and spreading grower. Fruit of medium size, oblate; skin greenish-white with a dull red cheek in the sun. Flesh greenish-white, firm, juicy, mildly acid, with a pleasant aromatic flavor. Liable to scab. Season winter.

Winter-Green.—Tree a strong grower. Fruit above medium in size, oblate, slightly conical; skin russet-yellow. Flesh yellowish, moderately juicy, sub-acid with a pleasant flavour. Season winter.

Danver's Winter Sweet.—Tree a slow grower. Fruit small to medium, oblong, conical; skin smooth dull yellow with a red cheek. Flesh yellow, firm, sweet with a fine flavour. Season winter.

Lord Nelson.—Tree a medium grower. Fruit small, conical; skin greenish-yellow with a faint blush on the sunny side. Flesh yellowish, crisp, moderately juicy, mildly acid, often deformed and scabby. Season winter.

Babbit.—Tree a strong grower. Fruit below medium size, conical; skin greenish-yellow, with a dull red cheek on the sunny side. Flesh white, firm, moderately juicy, somewhat acid, often scabby and deformed. Season winter.

Hyfill.—Tree a strong healthy grower. Fruit small, oblate, conical; skin greenish, with purple nearly over the whole surface, and a few white dots. Flesh greenish-white, firm, juicy, mildly acid, with a pleasant flavour. Season winter.

North Carolina Limber Twig.—Tree a medium grower. Fruit of medium size, conical; skin green, with purple over nearly the whole surface. Flesh white, firm, juicy, nearly sweet with a pleasant flavour. Season winter.

Edeldorfer.—Tree a strong grower. Fruit small, globular, tapering slightly to the eye; skin yellowish-white, with a reddish cheek and a few whitish dots. Flesh yellowish, firm, juicy, mildly acid, with a pleasant flavour. Season Winter.

Red Winter Tauben.—Tree a strong grower. Fruit below medium size, conical; skin green with a red cheek and many white dots. Flesh white, firm, juicy, mildly sub-acid, with a pleasant flavour. Somewhat scabby. Season winter.

Black Annette.—Tree a vigorous grower. Fruit small, roundish, conical; skin green, with dark red nearly over the whole surface. Flesh firm, not juicy, sub-acid. Season winter.

Maxey.—Tree only a moderate grower. Fruit of medium size, roundish, slightly conical; skin green with a red cheek and a few stripes of dull red, and sprinkled with white dots. Flesh greenish-white, firm, mildly acid. Season winter.

Cranberry Winter.—Tree a moderate grower. Fruit small, conical; skin yellow, with a little red on the sunny side. Flesh white, firm, moderately juicy, with a pleasant flavour. Season winter.

Parker's Pippin.—Tree a strong grower. Fruit below medium size, globular, slightly conical; skin orange-russet, with occasionally a blush on cheek. Flesh white, juicy, mildly acid, with a pleasant flavour. Season winter.

Spanish Borsdorf.—Tree a vigorous grower. Fruit large, roundish, conical; skin greenish white with many gray dots. Flesh white, crisp, juicy, mildly sub-acid, firm, and of good flavour.. Season winter.

Bauman's Reinette.—Tree a vigorous grower and an early bearer. Fruit small to medium, roundish oblate ; skin greenish-yellow, with a reddish blush and a few brown dots. Flesh yellowish, juicy, firm, fine-grained, nearly sweet, of good flavour. Season winter.

Red Winter Pigeon.—Tree a moderate grower. Fruit of medium size, conical ; skin greenish-yellow, with a small red cheek and many white dots. Flesh white, firm, sprightly, acid. Season winter.

Lincoln.—Tree a strong grower. Fruit medium to large, oblate, conical ; skin greenish-yellow, with a bright red blush and a few grayish dots. Flesh white, firm, moderately juicy, mildly acid, with a pleasant flavour. Season winter.

Palmer Greening.—Tree a vigorous grower and an early bearer. Fruit above medium size, roundish, oblate ; skin yellowish-green, with a clear red cheek and many grey dots. Flesh white, crisp, juicy, sub-acid, with a pleasant aromatic flavour. Season winter.

Brownlee's Russet.—Tree a vigorous grower. Fruit medium to large, roundish flattened ; skin green with a dull russet-red cheek. Flesh greenish-white, tender, juicy, aromatic, sweet. Season winter.

Nelson Sweet.—Tree a vigorous grower and early bearer. Fruit of medium size, roundish, flattened ; skin dull greenish-yellow, with a bronze-red cheek. Flesh yellowish, firm, moderately juicy, sweet. Season winter.

New Berner Rose.—Tree a strong grower. Fruit small, conical; skin greenish yellow, with splashes of dull red in the sun, and small whitish dots. Flesh greenish white, juicy, firm, sprightly, acid. Season winter.

Aushaulder.—Tree a medium grower. Fruit of medium size, conical; skin greenish yellow, nearly overspread with dull red and with many white dots. Flesh greenish white, firm, juicy, mildly acid. Season winter.

Spath's Seedling.—Tree a vigorous grower. Fruit of medium size, oblong conical; skin green, nearly overspread with a deep red and a few white dots. Flesh white, juicy, firm, mildly acid. Season winter.

Chelmsford Wonder.—Tree a vigorous grower. Fruit above medium size, oblate, globe-shaped, ribbed; skin yellow, with a pink cheek and sprinkled with carmine dots. Flesh yellowish, firm, a little coarse, moderately juicy, mildly acid. Season winter.

Himbeer.—Tree a medium grower. Fruit small, globular; skin greenish white, with a little red on the sunny side. Flesh white, crisp, moderately juicy, sweet. Season winter.

Calville Oberslebener.—Tree a strong grower. Fruit small, round, obtuse, conical; skin yellow with a bright clear, red cheek. Flesh yellowish, crisp, moderately juicy, with a pleasant flavour. Season winter.

Brakefield Seedling.—Tree a strong grower and early bearer. Fruit small, oblate, conical; skin yellow, splashed with two shades of red. Flesh white, firm, juicy crisp, with a fine aromatic flavour, nearly sweet. Season winter.

Nor-western Greening.—Tree a strong grower and early producer. Fruit of medium size, globular, tapering a little to the eye ; skin greenish-yellow. Flesh white, fine-grained, juicy, mildly acid, with a pleasant flavour. Season winter.

Kennedy Seedling.—Tree a strong grower and free producer. Fruit of medium size, irregularly globe shaped; skin greenish-yellow, nearly covered with deep red and sprinkled with a few white dots. Flesh white, often stained with red, crisp, juicy, sub-acid, with a pleasant flavour. Season winter.

Lady Finger.—Tree a vigorous grower. Fruit of medium size, oblong, conical ; skin yellow, freely splashed with red and sprinkled with brown dots. Flesh whitish, firm, not juicy, nearly sweet. Season winter.

Norcia.—Tree a moderate grower. Fruit small, conical; skin yellow, nearly covered with streaks and splashes of red in two shades. Flesh white, firm, juicy, mildly acid, with a pleasant flavour. Season winter.

Counsillor Niemetz.—Tree a vigorous grower. Fruit of medium size, round, flat; skin greenish-yellow, with red over nearly the whole surface, and a few whitish dots, Flesh yellowish-white, juicy, tender, mildly acid, with a pleasant aromatic flavour. Season winter.

PEARS.

The same cause that prevented the blossoms on the apple trees from setting, affected the pears also. Many of the young trees and all of the old ones were full of bloom, but very few had any fruit, the blossoms falling without forming fruit at all.

The Bartlett, Vicar of Winkfield and the Keiffer gave light crops, and the Beurre Clairgeau had a few specimens. These formed the larger part of the crop on the older trees. The following pears fruited for the first time :

Koolstock.—Tree a medium grower. Fruit above medium size, pyriform tapering sharply to the stem, which is one inch long; skin whitish green, with many small gray dots. Flesh white, juicy, smooth, fine-grained, gritty near the core, and a little astringent. Season last of August.

Loriol de Barney.—Tree a moderate grower. Fruit long pear shape, smooth and tapering to a point at the stem; skin greenish, nearly covered with orange and sprinkled with small gray dots. Flesh whitish, fine-grained, juicy, sweet, with a pleasant flavour. Season September.

King Sobieski.—Tree a slow grower. Fruit blunt pyriform, of medium size; skin orange with a reddish cheek and freely sprinkled with gray dots. Flesh whitish, fine-grained, juicy, sweet, with a pleasant flavour. Season, September.

Madam Verte.—Tree a slow grower. Fruit of medium size, almost globular; skin greenish orange, with a bright orange cheek. Flesh white, sweet, not very juicy, aromatic. Season September.

Diel's August.—Tree a strong grower. Fruit above medium size, obtuse pyriform; skin orange-yellow, with many brown dots and patches of russet. Flesh yellowish, coarse grained, slightly astringent. Not of fine quality. Season October.

Boisbunel.—Tree a strong grower. Fruit small, pyriform; skin greenish yellow, with a bronze red cheek and many brown dots. Flesh whitish, a little coarse, juicy, sweet, with a pleasant flavour. Season October.

Beurre Dumortier.—Tree a medium grower. Fruit of medium size, roundish, pyriform; skin yellowish-green, with patches of russet and many russet dots. Flesh greenish white, juicy, fine-grained, sweet. Season October.

Coloma.—Tree a strong grower. Fruit small, pyriform; skin greenish yellow, with large patches of russet and many russet dots. Flesh white, juicy, breaking, with a pleasant vinous flavour. Season October.

Crassane d'Automne.—Tree a medium grower. Fruit of medium size, ovate, pyriform; skin yellowish russet green, sprinkled with russet dots. Flesh coarse-grained, not juicy, but sweet and of a pleasant flavour. Season October.

Dr. Gromier.—Tree a strong grower. Fruit below medium size, roundish, pyriform ; skin green, with a bronze-red cheek and small patches of russet. Flesh white, juicy, breaking, sweet, with a pleasant flavour. Season October.

Luizette.—Tree a medium grower. Fruit above medium size, oblong, obtuse, pyriform ; skin greenish yellow, with a little red on the sunny side. Flesh whitish, fine grained, buttery, juicy, sweet. Season last of October.

King Charles.—Tree a vigorous grower. Fruit large, oblong, obtuse, pyriform; skin greenish, nearly covered with russet and sprinkled with yellow dots. Flesh white, fine grained, juicy, slightly astringent. Season last of October and November.

Calixte Mignot.—Tree a moderate grower. Fruit below medium size, long, smooth, pyriform; skin smooth, yellow, with a russet-reddish cheek and a few small brown dots. Flesh white, fine grained, juicy, with a pleasant flavour. Season November.

Sivenisher.—Tree a vigorous grower. Fruit of medium size or below medium, roundish, obovate ; skin green, shading to yellowish-green. Flesh white, juicy, tender, melting, with a sweet pleasant flavour. Season November.

PLUMS.

The plum trees never were more promising or more laden with bloom than last spring, even very small trees recently planted were full of flower, but beginning to blossom as they did in the latter part of March, and in the first part of April, when the weather was unfavourable for the proper fertilization of the flowers or for the development of the young plum, the result was disappointing. At the same time much wet weather prevented effective spraying, and was favourable for the development of fungus diseases, and in many cases the brown rot had attacked the fruit before it was half grown. A few of the trees were sprayed seven times from just before the breaking of the buds until the fruit was three-quarters grown, but the spraying was of little benefit, often being washed off soon after it had been applied, and thus did not prevent the rot. Some varieties appear to be particularly susceptible of rot and are a menace to other sorts that perhaps would otherwise escape. In the following list short descriptions are given of those sorts that fruited for the first time this season :—

Meroldt's Reine Claude.—Tree a strong grower. Fruit below medium size, globular, with a shallow suture ; skin pale yellow. Flesh yellowish, firm, not juicy or very sweet. Season middle of September.

Metz Mirabelle.—Tree a strong grower. Fruit small, globular; skin yellow. Flesh yellow, firm, juicy, sweet, stone very small. Season middle of August.

Brauman.—Tree a medium grower. Fruit small to medium, globular ; skin greenish yellow, with a whitish bloom. Flesh greenish, not juicy, sweet, with a pleasant flavour. Season last of August.

Chester.—Tree a strong grower. Fruit below medium size, oval ; skin dark red or nearly purple, with a thin bloom. Flesh greenish, moderately juicy, sweet. Season early September.

Montfort.—Tree a medium grower. Fruit of medium size, globular, with a deep suture ; skin reddish purple, with a white bloom. Flesh greenish, not juicy, sweet, with a pleasant flavour. Season last of August.

Catharine.—Tree a medium grower. Fruit medium to large, egg-shaped ; skin reddish, with a white bloom. Flesh yellow, sweet, juicy, with a pleasant flavour. Season last of August.

Late Muscatel.—Tree a strong grower. Fruit of medium size, roundish, one side enlarged ; skin reddish with a white bloom. Flesh greenish, sweet, rather dry, of good flavour. Season early September.

Throop.—Tree a strong grower. Fruit below medium size, oval, tapering to each end ; skin light red, with a whitish bloom. Flesh yellowish, and very juicy, sweet, with a pleasant flavour. Season early September.

Red Egg.—Tree a vigorous grower. Fruit small, oblong with neck, one side enlarged ; skin reddish. Flesh yellowish, sweet, rather dry, and granular. Season early September.

Dry's Seedling.—Tree a free grower. Fruit small to medium, oval ; skin reddish yellow, with a few brown dots. Flesh yellow, sweet and juicy, with a pleasant flavour. Season early September.

Partridge.—Tree a strong grower. Fruit of medium size, roundish, with a suture ; skin red, with a white bloom. Flesh yellowish, rather dry, sweet, with a pleasant flavour. Season early September.

Blue Egg.—Tree a medium grower. Fruit below medium size, oblong, egg-shaped, with a shallow suture ; skin light red, with a white bloom. Flesh yellowish, firm, moderately juicy, sweet, with a pleasant flavour. Season middle of September.

Swan's Yellow.—Tree a strong upright grower. Fruit of medium size, roundish, globe-shaped, suture deep, with a depression at each end. Flesh yellow, juicy, a little coarse, moderately sweet, with a pleasant flavour. Season middle of September.

Britzer Egg.—Tree a vigorous grower. Fruit below medium size, egg-shaped ; skin yellow. Flesh yellow, juicy, sweet, with a pleasant flavour, a little coarse in the grain. Season middle of September.

Niemburg Egg.—Tree a vigorous grower. Fruit of medium size, egg-shaped ; skin pale, dull red, with a whitish bloom. Flesh yellow, firm, moderately juicy, sweet, with a pleasant flavour. Season early and middle of September.

Steptoe.—Tree a strong grower. Fruit below medium size, egg-shaped ; skin purple, with a thin bloom. Flesh yellowish, juicy and sweet, with a pleasant flavour. Season September.

Mistake.—Tree a strong grower. Fruit above medium size, oblong oval, with a suture and one side enlarged ; skin purple, with a white bloom. Flesh yellowish, a little coarse, juicy, sweet, with a pleasant flavour. Season September.

Large English Damson.—Tree a strong and upright grower. Fruit a large Damson ; skin purple, with a thin bloom. Flesh greenish, juicy, with a pleasant flavour. Season last of September.

The varieties of trees with fruit free or nearly free from rot this year were Monarch, Mitchelson, Sultan, Annie Spath, Clyman, Cochet Pere and Blue Apricot. Of those described as fruiting for the first time, some were free from rot and some were not, but another season will give more evidence on which to base an opinion as to their power to resist this disease.

CHERRIES.

The cherry trees were very full of bloom this year, but during the blossoming period there were two frosts, and almost continuous cold rains, and most of the blossoms failed to fertilize, and as the rains continued through May and most of June, spraying was not effective, and the few cherries that did grow were many of them destroyed by the brown rot. A few of the young trees produced a few specimens, some of which, if they can be protected from the rot will be of value in this province.

The following brief descriptions are presented as to the character and date of ripening of the new sorts which have fruited here for the first time this season :—

Royal Morello.—Tree a medium grower. Fruit medium to small, round flattened; skin bright glossy red. Flesh juicy, pleasant, sprightly acid, firm. Season early July.

Winkler's White.—Tree a strong grower. Fruit medium to large, heart-shaped, skin yellowish red. Flesh firm, juicy, sweet. Season early July.

Kircheimer.—Tree a strong grower. Fruit of medium size, roundish oval ; skin dark glossy red. Flesh mild, pleasantly acid. Season early July.

Fromm's Heart.—Tree a strong grower. Fruit of medium size, heart-shaped ; skin dark glossy red. Flesh firm, juicy, sweet, and of pleasant flavour. Season early July.

Beauty of Marienhohe.—Tree a strong grower. Fruit small, roundish heart-shaped; skin light red with golden dots. Flesh yellowish, moderately juicy, sweet, Season early July.

**Seedling No.* 1.—Tree a vigorous grower. Fruit large, obtusely heart-shaped; skin glossy red. Flesh firm, juicy, sweet with a pleasant flavour. Season early July.

Seedling No. 2.—Tree a moderate grower. Fruit medium to large, heart-shaped ; skin bright red. Flesh firm, moderately juicy, sweet. Season early July.

Seedling No. 4.—Tree a strong grower. Fruit large, obtusely heart-shaped ; skin yellowish red. Flesh yellowish, juicy, tender, pleasantly acid. Season early July.

Seedling No. 9.—Tree a strong grower. Fruit small to medium in size, heart-shaped ; skin dark red. Flesh tender, juicy, moderately sweet, with a pleasant flavour. Season early July.

Guben.—Tree a medium grower. Fruit of medium size, round, flattened ; skin dark glossy red. Flesh red, tender, juicy, and pleasantly acid. Season early July.

Hedelfinger.—Tree a strong grower. Fruit large, heart-shaped ; skin dark red. Flesh firm, sweet, with a pleasant flavour. Season middle of July.

Schmehls.—Tree a vigorous grower. Fruit large, obtusely heart-shaped ; skin mottled, yellow and pale red. Flesh tender, juicy, and sweet, with a pleasant flavour. Season middle of July.

Seedling No. 19.—Tree a medium grower. Fruit of medium size, oval ; skin yellowish red. Flesh tender, juicy and sweet, with a pleasant flavour. Season middle of July.

Weichsel Ostheim.—Tree a medium grower. Fruit of medium size, roundish ; skin dark glossy red. Flesh juicy, tender, slightly acid, with a pleasant flavour. Season middle and last of July.

Lucien.—Tree a strong grower. Fruit heart-shaped ; skin pale yellowish red. Flesh juicy, tender, sweet and rich. Season middle of July.

Berlin Amarelle.—Tree a vigorous grower. Fruit medium to large, oval ; skin dark glossy red. Flesh tender, juicy and pleasantly acid. Season middle and last of July.

Germersdorf.—Tree a strong grower. Fruit large, obtusely heart-shaped ; skin glossy red. Flesh yellowish red, tender, juicy, sweet, with a pleasant flavour. Season last of July.

Princess.—Tree a moderate grower. Fruit very large, heart-shaped ; skin light red. Flesh pale yellowish red, tender, juicy, sweet, with a pleasant flavour. Season, middle and last of July.

Shadow Amarelle.—Tree a medium grower. Fruit of medium size, oval ; skin dark red. Flesh dark red, tender, juicy, mildly acid, with a pleasant flavour. Season, middle and last of July.

PEACHES, APRICOTS AND NECTARINES.

The peach, apricot and nectarine trees were very beautiful with bloom about the last of March. One peach and not one apricot or nectarine was the result from the

* These seedlings under numbers have all been produced at the Experimental Farm.

orchards on the valley level. On the mountain, at about 600 feet elevation, a few Amsden and Foster trees had a light crop.

ALMONDS.

The Hard-shell Almonds bloomed but bore no fruit, and none of the soft-shell varieties have ever had any fruit, while the trees are large and thrifty and old enough to have borne several crops. As these seem to be useless in this climate, it is scarcely worth while continuing their cultivation.

QUINCES.

Constantinople.—Tree a free grower. Fruit medium size, pear-shape ; skin smooth clear orange.

MEDLARS.

All the medlars produced a crop, blooming as they do very late in May, they are pretty sure of mild weather, and always produce a crop.

GRAPES.

The grape vines made a vigorous growth, but were very late in starting and also very late in blooming, averaging 21 days later than previous years. The fruit in most instances failed to set and even the earliest sorts were not nearly ripe by October 1.

SMALL FRUITS.

There was a fairly good crop of small fruits this year. The blossoms were somewhat injured by the cold rains, and the frequent rain in June made the strawberries soft, and much of the crop was unfit for any but a local market. The rain also injured the currants, but the raspberries, black caps and black berries had fine weather for ripening and were of very good quality.

RED AND WHITE CURRANTS.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Knight's Early (red.)	July 7	Vigorous ...	Small	Cluster short, fairly well filled, good flavour.	Moderately productive.
La Fertile.....	" 7	" ..	Large	Cluster long, well filled, very good quality.	Productive.
New Red Dutch	" 7	" ..	Large medium	Cluster medium in length, well filled, good quality.	"
La Turinese....	" 7	" ..	Medium	Cluster medium in length, well filled, good quality.	"
Fay's Prolific..	" 7	" ..	Large	Cluster long, well filled, good quality.	"
Large White Brandenburg	" 7	" ..	"	Cluster long, well filled, sweet, good flavour, very fine.	"
Frauendorfer (red.)	" 7	" ..	"	Cluster long, well filled, good flavour.	"
Verrier's White	" 7	" ..	Large medium	Cluster long, not well filled, good flavour.	Moderately productive.
Chenonceau (red.)	" 7	" ..	Large	Cluster long, well filled, sweet, fine flavour.	Productive.
Eyatt's New White.	" 7	" ..	Large medium	Cluster long, fairly well filled, good flavour.	"
Red Gondoin...	" 8	" ..	Small	Cluster short, not well filled, poor quality.	Not productive.
White Pearl....	" 8	" ..	Medium......	Cluster medium in length, not very well filled, good flavour.	Moderately productive.
Victoria	" 8	" ..	Large	Cluster medium in length, not well filled, fairly good flavour.	"
Red Cherry....	" 8	" ..	"	Cluster long, moderately well filled, quality fair.	"
No. 51.........	" 8	" ..	Small	Cluster short, fairly well filled, sweet, good flavour.	"
London Red...	" 8	" ..	Large medium	Cluster long, fairly well filled, small, good flavour.	Productive.
White Esperen.	" 9	" ..	Small	Cluster, short, fairly well filled, sweet, good flavour.	Moderately productive.
Large White...	" 9	" ..	Large medium	Cluster medium in length, well filled, good flavour.	Productive.
Rankin's Red..	" 10	" ..	Small	Cluster short, acid, not very good.	Not productive.
La Hative.....	" 10	" ..	Medium......	Cluster medium, sweet, good.	Productive.
Moore's Ruby..	" 10	" ..	Small........	Cluster medium in length, not well filled, acid, fair flavour.	Moderately productive.
Prince Albert..	" 10	" ..	Large medium	Cluster long, moderately well filled, good flavour.	"
White Grape...	" 10	" ..	" ..	Cluster medium in length, well filled, good quality.	"
Versailles (red.)	" 10	" ..	Medium......	Cluster medium in length, well filled, good quality.	"
North Star.....	" 10	" ..	"	Cluster medium in length, fairly well filled, good flavour.	Productive.
Red Dutch.....	" 10	" ..	"	Cluster medium in length, well filled, acid, but good flavour.	"
La Conde.....	" 10	" ..	"	Cluster medium in length, not well filled, good flavour.	Moderately productive.
White Imperial.	" 10	Moderately vigorous.	Large medium	Cluster medium in length, fairly well filled, sweet, good flavour.	"
Large White Dessert.	" 12	Vigorous ...	Large	Cluster long, well filled, acid, good flavour.	"
Large Red.....	" 12	" ..	Medium......	Cluster long, well filled, good flavour.	"

RED AND WHITE CURRANTS—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
English Red...	" 12	" ..	Large medium	Cluster long, well filled, good quality.	Productive.
Raby Castle....	" 12	" ..	Large	Cluster long, well filled, acid, good flavour.	"
Champaigner (white.)	" 12	" ..	Small	Cluster medium in length, fairly well filled, good flavour.	Moderately productive.
Ringen's (red)..	" 13	" ..	"	Cluster medium in length, fairly well filled, good flavour.	Productive.
White Cherry..	" 15	" ..	Large medium	Cluster long, well filled, sweet, good flavour.	"
Beauty of St. Giles.	" 15	Moderately vigorous.	Large	Cluster long, well filled, good flavour.	"
De la Rochepoze	" 15	" ..	Small	Cluster short, not very well filled, acid, fair flavour.	Moderately productive.
White Dutch...	" 15	Vigorous ...	Medium......	Cluster medium in length, well filled, acid, good flavour.	"
White Transparent.	" 15	" ..	"	Cluster medium in length, fairly well filled, good flavour.	"

BLACK CURRANTS.

Ruler.........	July 8	Vigorous....	Medium	Cluster medium in length, mild, sweet, good flavour.	Moderately productive.
Stirling........	" 8	" ..	"	Cluster medium in length, flavour a little rank.	" "
Bang Up.......	" 8	" ..	Large	Cluster long, mild, sweet flavour.	" "
Dominion	" 10	" ..	Medium......	Cluster short, mild, good flavour.	" "
Lennox	" 10	" ..	"	Cluster medium in length, fairly good flavour.	" "
Ambrafarbidge.	" 10	" ..	Large	Cluster medium in length, mild, good flavour.	" "
Victoria	" 10	" ..	"	Cluster medium in length, sweet, good flavour.	Productive.
Gewohnliche ...	" 10	" ..	"	Cluster short, mild, good flavour.	Moderately productive.
Beauty	" 10	" ..	Medium......	Cluster short, sweet, fairly good flavour.	Not productive.
Star............	" 10	" ..	"	Cluster medium in length, sweet, pleasant flavour.	Moderately productive.
London........	" 11	" ..	"	Cluster medium in length, good quality.	" "
Success	" 11	" ..	"	Cluster long, sweet, mild flavour.	" "
Parker	" 11	" ..	Small	Cluster medium in length, flavour rank.	" "
Pearce.........	" 12	Moderately vigorous.	Medium......	Cluster medium in length, mild, pleasant flavour.	" "
Middlesex	" 12	Moderately vigorous.	Medium......	Cluster medium in length, quality fair.	" "
Kentish Hero..	" 12	Vigorous ...	"	Cluster medium in length acid good flavour.	Productive.
Stewart.... ...	" 12	" ..	"	Cluster medium in length, flavour a little rank.	"
Wood..........	" 12	" ..	"	Cluster medium in length, fair quality.	Moderately productive.
Lanark	" 12	" ..	"	Cluster short, flavour rank..	" "
Eagle	" 12	" ..	Large medium	Cluster long, thick skin, flavour rank.	" "

BLACK CURRANTS—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Black Naples...	July 12	Vigorous....	Large medium	Cluster long, sweet, mild flavour.	Moderately productive.
Ethel..........	" 12	Moderately vigorous.	Medium. . .	Cluster medium in length acid fair flavour.	" "
Oxford.........	" 14	Vigorous....	"	Cluster medium in length, quality fair.	Not productive.
Norton	" 14	" ..	"	Cluster medium in length, mild, sweet, good flavour.	Productive.
Bella	" 14	" ..	Small	Cluster short, flavour rank..	Not productive.
Monarch	" 14	" ..	Medium ...	Cluster long, flavour good ...	Productive.
Lee's Prolific...	" 15	" ..	"	Cluster medium in length, flavour fairly good.	"
Kentville	" 16	" ..	"	Cluster short, acid, flavour rank.	Moderately productive.
Henry	" 17	" ..	"	Cluster long, sweet, good flavour.	Productive.
Ogden's Black..	" 17	" ..	"	Cluster short, flavour rank.	"
Ontario........	" 17	" ...	Large	Cluster long, acid, flavour rank.	Moderately productive.
Climax	" 17	" ..	"	Cluster long, acid, quality fair.	Productive.
Pomona.......	" 18	" ..	Very large....	Cluster long, sweet, good flavour, the best we have.	"
Prince of Wales	" 18	" ..	Large	Cluster long, sweet, good flavour, next in quality to Pomona.	"
Lewis..........	" 18	" ..	Small	Cluster medium in length, sweet, good flavour.	Moderately productive.
Baldwin..	" 20	Not vigorous	"	Cluster short, not very good qualty.	" "
Manitoba Wild.	" 20	Vigorous....	"	Cluster short, flavour rank..	Not productive.

RED AND YELLOW RASPBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Hansell	June 27	Vigorous ...	Small	Crumbly, light red, round, good flavour.	Productive.
Thompson.	July 1	" ...	"	Moderately firm, round, bright red, good flavour.	"
Crimson Beauty	" 1	Moderately vigorous.	Medium......	Firm, round, bright red, good flavour.	"
Marlboro	" 1	Vigorous ...	Small	Firm, round, bright red, good flavour.	"
Champion......	" 1	" ...	"	Soft, sweet, quality only fair.	Moderately productive.
Phoenix.	" 1	" ...	Large	Firm, round, bright red, good flavour.	Productive.
Battler's Giant.	" 1	" ...	Medium......	Moderately firm, dark red, fair flavour.	"
Arnold's Hybrid	" 1	" ...	"	Crumbly, round, light red, fair flavour.	Moderately productive.
Paragon........	" 1	" ...	Large medium	Firm, bright red, sweet, fair quality.	Productive.
Northumberl'nd Fill Basket.	" 3	" ...	Very large.. ..	Firm, conical, dark red, very good quality.	"
Belle de Fontenay.	" 4	" ...	Large medium	Firm, dark red, round, good quality.	"
Carter's Prolific	" 4	Moderately prolific.	Small	Firm, sweet, fair flavour.....	"
Sugar of Metz..	" 4	Vigorous....	Large medium	Soft, yellow, round, sweet, not of very much value.	"
New Fastollf...	" 6	" ...	Large	Firm, conical, dark red, sweet, good quality; continues long in bearing.	"

RED AND YELLOW RASPBERRIES—*Continued.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Large Yellow..	July 6	Vigorous...	Large........	Firm, obtuse, conical, dull yellow, sweet.	Productive.
Lord Beaconsfield.	" 6	" ..	"	Firm, round, a bright red, sweet, good flavour.	"
Herrenhauser Red Perpetual	" 6	" ...	Medium	Firm, round, dark red, sweet, fair flavour.	Moderately productive.
R. B. Whyte.	" 6	" ...	Large........	Moderately firm, round, dark red, sweet, good flavour.	Productive.
Garnet.........	" 6	" ..	Small........	Firm, purplish-red, round, not very good quality.	Not productive.
Malta.........	" 6	Moderately vigorous.	Medium	Soft, yellow, round, good flavour.	"
French Vice-President.	" 8	Vigorous....	Very large....	Firm, conical, dark red, sweet, good flavour, but adheres too tightly to the core.	Productive.
Knevit's Giant.	" 8	" ...	Large........	Crumbly, round, bright red, sweet, good flavour.	"
Autumn Surprise.	" 10	" ...	Large medium	Soft, yellow, round, not very good.	"
Baumforth Seedling.	" 10	Moderately vigorous.	Small medium	Moderately firm, round, dark red, sweet, flat flavour.	"
Wilder........	" 10	Vigorous....	Medium......	Moderately firm, sweet, fairly good flavour.	Not productive.
Brinckle's Orange.	" 10	" ...	Large........	Soft, sweet, good flavour....	Productive.
Golden Queen..	" 10	" ...	"	Firm, sweet, good; best yellow raspberry we have.	"
All Summer....	" 10	" ...	"	Firm, conical, bright red, good flavour.	"
Muskingum....	" 10	" ...	Small medium	Crumbly, dark red, sweet....	"
Cariboo Wild..	" 10	" ...	Small........	Soft, crumbly, tart, good flavour.	Not productive.
Turner........	" 10	" ...	"	Crumbly, round, bright red, sweet.	"
Sarah..........	" 10	" ...	Large medium	Firm, round, bright red, very good quality.	"
Guinea........	" 10	Feeble.....	Small.........	Round, purplish red, not good.	Not productive.
Mary..........	" 10	Vigorous ..	"	Round, red, poor flavour.....	"
Lady Anne ...	" 10	" ...	"	Yellow, soft, flat flavour.....	"
Sharpe........	" 10	Feeble......	"	Red, sweet, not very good...	"
Craig.........	" 10	Vigorous...	Medium......	Rather soft, clear red, good flavour	Productive.
Percy..........	" 13	Moderately vigorous.	Large medium	Firm, purplish red, sweet, good flavour.	Moderately productive.
Muriel........	" 13	Vigorous...	" ..	Firm, dark red, round, good flavour.	" "
Bee Hive......	" 13	" ...	" ..	Crumbly, dark red, sweet, good flavour.	" "
Queen of the Market.	" 13	" ...	Large........	Firm, dark red, sweet, good quality; like Cuthbert.	Productive.
Red Herrenhauser.	" 13	" ..	Medium......	Firm, large, dark red, round, fair flavour.	"
Shaffer's Colossal.	" 13	" ...	Large.......	Firm, purplish red, acid.....	"
Garfield.......	" 13	" ...	Medium......	Moderately firm, red, round, good flavour.	"
La Mercier.....	" 14	Moderately vigorous.	Large........	Crumbly, large, round, dark red, sweet, good flavour.	"
Chili..........	" 14	Vigorous...	Large medium	Moderately firm, large, dark red, sweet, good flavour.	"
Duke of Brabant	" 14	" ...	Large........	Firm, roundish conical, bright red, sweet, very good quality	"

RED AND YELLOW RASPBERRIES—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Col. Wilder....	July 14	Feeble......	Medium	Soft, pale yellow, sweet, not of much value.	Moderately productive.
Empire........	" 15	" ...	Small	Firm, round, acid, not very good.	Not productive.
Hebner	" 15	Vigorous ...	Medium.. ...	Soft, red, sweet, good flavour, not of much value.	"
Cuthbert	" 15	" ..	Large	Firm, conical, dark red, very good quality.	Very productive.
Hornet	" 15	Feeble......	Small medium.	Moderately firm, large, fair flavour.	Moderately productive.
Clarke..	" 15	Vigorous ...	Medium	Moderately firm, conical, red, sweet, fair flavour.	Productive.
Carleton	" 15	" ...	"	Firm, round, red, sweet, good flavour.	"
Fastolff..	" 17	" ...	"	Firm, red, sweet...........	"
Pauline........	" 17	" ...	Large	Rather soft, round, dark red, crumbly, sweet, good flavour.	"
Miller	" 17	" ...	Medium	Large, round, red, sweet, good flavour.	"
Nonpareil......	" 17	" ...	Small.........	Moderately firm, bright red, sweet, good flavour.	"
Barnet	" 17	Moderately vigorous.	Medium	Soft, round, red, sweet, not good quality.	Not productive.
Oregon Late ...	" 17	" ..	"	Firm, sweet, fair flavour.....	"
Lizzie...... ...	" 24	Feeble......	"	Round, red, sweet..........	Moderately productive.
Franconia......	" 24	Moderately vigorous.	Small........	Not of any value......	" "
Queen Victoria.	" 24	Vigorous ...	Medium	Crumbly, red, quality fair...	" "
Sir John.	" 24	" ...	Small medium	Crumbly, red, acid, not of much value.	Productive.
Goliath	" 24	" ...	Large medium	Moderately firm, round, dark red, sweet, good flavour.	"
Prince of Wales	" 24	Moderately vigorous.	Medium	Firm, round, dark red, sweet, good flavour.	Moderately productive.

BLACK CAP RASPBERRIES.

Smith's Prolific.	July 7	Vigorous....	Medium	Fairly good quality..........	Productive.
Early Ohio.....	" 10	"	Large medium	Not very good quality.... ..	"
Nemaha. ...	" 10	"	Large	Fine flavour, good quality....	"
Older.....	" 15	"	Large medium	Good quality...............	"
Conrath	" 16	"	Large	A fine flavoured, handsome berry; a little acid.	"
Lovett........	" 16	Moderately vigorous.	Medium......	Good quality..............	"
Cromwell	" 16	Vigorous....	"	Fairly good quality.....	"
American Yellow Cap.	" 18	"	Small	Sweet, good quality.........	"
Kansas	" 20	"	Medium.... .	" "	"
Palmer	" 20	"	"	Fairly good quality..........	"
Ada...........	" 20	"	"	" "	"
Gregg	" 21	"	Large	Very good quality.	"
Progress.......	" 23	"	"	Sweet, good quality.........	"
Jackson's May King.	" 23	"	Small medium	Poor quality.........	Moderately productive.
Hopkins......	" 23	"	Medium	Good quality................	Productive.

BLACKBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Early King	Aug. 6	Vigorous	Large medium	Good quality	Productive.
Minnewaska	" 6	"	"	Firm, good quality	"
Early Harvest	" 7	"	Medium	Quality only fair	Not productive.
Early Cluster	" 7	"	"	Sweet, firm, good quality	Productive.
Agawam	" 7	"	Large medium	Fine appearance and good quality.	"
Snyder	" 7	"	"	Very good quality	"
Hansel	" 8	Moderately vigorous.	Small	Not very good quality	Moderately productive.
Brunton	" 8	Feeble	"	Not good quality	Not productive.
Ohmer	" 8	Moderately vigorous.	Large	Fairly good quality	Productive.
Stone's Hardy	" 10	Vigorous	Large medium	Firm, sweet, good quality	"
Erie	" 10	"	Large	A little acid, but good quality	Moderately productive.
Taylor's Prolific	" 10	"	"	Sweet, good quality.	Productive.
Eldorado	" 10	"	Very large	Sweet, very fine flavour, good quality.	"
Wilson's Early	" 12	"	Large medium	Firm, good quality	"
Tecumseh	" 14	Moderately vigorous.	Small	Not very good quality	Not productive.
Kittatinny	" 14	Vigorous	Large medium	Acid; fairly good quality	Moderately productive.
Wilson Junior	" 16	"	Medium	Good quality	Productive.
Maxwell	" 16	Moderately vigorous.	"	Not very good quality.	Moderately productive.
Lawton	" 16	Vigorous	Large medium	Quality fair	" "
Oregon Ever-bearing.	Aug. 10 to Oct. 15	Very vigorous.	Large	Quality good when very ripe, a little acid.	Very productive.

STRAWBERRIES.

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Arrow	June 7	Vigorous	Medium	Firm; bright red; sweet, good flavour.	Productive.
Eleanor	" 7	"	Large medium	Firm; dark red; round; good flavour, sweet.	"
Dayton	" 7	"	Large	Firm; deep red; conical; sweet, good flavour.	"
Chairs	" 7	"	Large medium	Firm; bright red; conical; sweet, fine flavour.	"
Anna Kenedy	" 8	"	Medium	Firm; sweet, good quality	"
Van Deman	" 9	"	"	Firm; dark red; conical; good quality.	"
Alpha	" 10	"	Large medium	Firm; red; round; fairly good quality.	Not productive.
Iowa Beauty	" 10	"	Large	Firm; bright red; very good quality.	Productive.
Alexander II	" 10	"	Medium	Firm; bright red; sweet, good flavour.	Moderately productive.
Omega	" 10	"	"	" "	Productive.
Bissel	" 10	"	Large	Rather soft; light red; irregular in shape; stem long and strong.	Moderately productive.
Timbrell	" 11	"	"	Firm; sweet, good quality; stem long and strong.	Productive.
Bonnie Lass	" 12	Moderately vigorous.	Medium	Firm; sweet, good quality	Moderately productive.
Brandywine	" 12	Vigorous	Large medium	Firm; conical; dark red; good quality; stem short.	" "

STRAWBERRIES—*Concluded.*

Name.	Date of Ripening.	Growth of Plant.	Size of Berry.	Quality.	Productiveness.
Warfield	June 17	Vigorous	Medium	Firm; dark red; round; sweet, good flavour.	Productive.
Windsor Chief	" 13	"	Large medium	Firm; deep red; conical; acid; good flavour.	"
Greenville	" 13	"	Large	Firm; bright red; round; even in size; very good quality.	"
Maxwell	" 13	"	Large medium	Firm; light red; round; sweet, good quality.	"
Tennessee Prolific.	" 13	"	"	Firm; bright red; conical; a little acid; good quality.	"
Devereau	" 14	"	Medium	Moderately firm; light red; conical; good quality.	Moderately productive.
Mary	" 15	"	Large medium	Firm; pale red; sweet, good quality.	" "
Weston	" 15	Moderately vigorous.	Medium	Fairly firm; conical; dark red; a little acid; fair flavour.	" "
Laxford Hall	" 15	Vigorous	Large	Firm; light red; conical; even in size; good quality.	Productive.
Dr. Hogg	" 15	"	Medium	Firm; sweet, good flavour	Moderately productive.
Crockett's Choice.	" 15	"	Small	Firm; dark red; conical; sweet, good flavour.	Not productive.
Improved Westbrook.	" 16	"	Large	Moderately firm; light red; fairly good quality.	Productive.
Michigan	" 17	"	Very large	Firm; ripens unevenly and is uneven in shape; fairly good flavour.	Moderately productive.
H. W. Beecher	" 17	"	Large	Firm; light red; sweet, good flavour.	Productive.
Improved Jucunda.	" 17	"	"	Firm; bright red; round; sweet, very good quality.	"
Magoon	" 17	"	Very large	Firm; bright red; sweet, good quality but a little uneven in shape.	"
British Queen	" 12	"	Large	Firm, dark red, roundish conical, sweet, good flavour.	Moderately productive.
Imperial Newman.	" 17.	"	Medium	Firm, bright red, conical, good quality.	"
Sir Joseph Paxton.	" 18.	"	"	Firm, fair quality	"
Empress Eugenie.	" 18.	Moderately vigorous.	Small	Firm, sweet, good flavour	"
Enchantress	" 18.	"	Large	" "	"
Eclipse	" 18.	"	Small medium	Firm, light red conical, sweet, good flavour.	Not productive.
Arkansas Traveller.	" 19.	Vigorous	Large	Firm, dark red conical, sweet, good flavour.	Productive.
Kansas Prolific.	" 19.	"	Very large	Firm bright red, good quality, stem long and strong.	"
Laxton's Noble.	" 19.	Moderately vigorous.	Small	Poor quality	Not productive.
White Alpine	" 27.	Vigorous	Large	Firm, pinkish white, oblong, sweet, good flavour, stem long and strong.	Productive.

METEOROLOGICAL RECORD.

Date of Highest Temperature.	Degrees	Date of Lowest Temperature.	Degrees.	Rainfall.	Snowfall.	Sunshine.	
1900.		1900.		Inches.	Inches.	Hours.	Minutes.
December 18	56	December 30....	27	7·5	8	47	18
1901.		1901.					
January 20	59	January 9......	11	5· 7	19	44	12
February 25..........	54	February 5.	16	3·79	7	83	12
March 20.......	66	March 11.	30	3·16	....	67	6
April 30.............	71	April 18.......	28	2·79	4	127	54
May 26...............	90	May 13.........	38	4·80	....	167	54
June 14..............	83	June 28.........	41	7· 8	....	80	0
July 28...............	83	July 26...... ..	42	1·25	....	205	0
August 21............	91	August 1.......	45	....	....	224	6
September 18.........	79	September 28....	35	1·59	....	99	48
October 23.....	76	October 14......	36	4·15	....	92	6
November 3....... ..	66	November 18....	31	10·57	....	18	30
		Totals......		51·30	30	1,157	6

The record for the year ending November 30 shows a low rate of sunshine for the year, and a light rainfall.

I have the honour to be, sir,
Your obedient servant,

THOS. A. SHARPE.

STATEMENT OF EXPENDITURE ON THE DOMINION EXPERIMENTAL FARMS FOR THE YEAR ENDING JUNE 30, 1901.

CENTRAL EXPERIMENTAL FARM—EXPENDITURE, 1900-1901.

Live stock	$ 935 65
Feed for stock, including veterinary services	998 53
Seed grain, seeds, trees, &c	437 70
Implements, tools, hardware and supplies	939 87
Drainage and drain tiles	1,501 91
Manure and fertilizers for experimental plots and Hort. dept	263 73
Travelling expenses	1,491 73
Exhibition expenses	261 69
Blacksmithing, harness supplies and repairs	849 55
Bee department	160 00
Salaries	1,916 25
Wages, farm work, including experimental work with grain and other farm crops; also, salaries of officers in charge	6,607 45
Wages, care of stock	2,345 25
Chemical department proportion chargeable to the Central Farm	1,184 26
Botanical and Entomological department proportion chargeable to the Central Farm	1,299 92
Horticultural department, including salary of officer in charge	4,829 89
Poultry department, including salary of officer in charge	1,660 06
Forestry department and care of grounds	1,068 98
Arboretum	684 16
Distribution of trees and tree seed	78 24
Office help, correspondence branch and messenger service	4,378 13
Printing and stationery	588 29
Seed testing and care of greenhouses	944 62
Dairy department	649 44
Contingencies	308 54
Books and newspapers	122 03
Telegrams and telephones	161 69
Steers purchased for feeding experiments	3,445 40
Hogs purchased for feeding experiments	256 28
	$ 40,369 24
LESS—Proceeds of sale of steers purchased for feeding experiments	5,266 55
	$ 35,102 69

EXPERIMENTAL FARM, NAPPAN, N.S.—EXPENDITURE, 1900–1901.

Live stock	$ 83 40
Feed for stock, including veterinary services	2,178 72
Seed grain, seeds, trees, &c	51 69
Implements, tools, hardware and supplies	382 31
Manure and fertilizers	29 98
Travelling expenses	399 01
Exhibition expenses	169 74
Blacksmithing, harness supplies and repairs	206 77
Salary of Superintendent, also proportion of salaries for general work, Ottawa	2,517 82
Wages, farm work, including experimental work with farm crops	2,310 91
Wages, care of stock	1,503 06
Chemical department, proportion chargeable to each branch farm	690 82
Botanical and Entomological department, proportion chargeable to each branch farm	525 00
Poultry department	129 91
Horticultural department, including salary of officer in charge	1,046 51
Forestry department, including care of grounds	112 00
Seed grain distribution	192 41
Contingencies, including postage, $28.10; mail delivery, $82.50	148 05
Printing and stationery	8 34
Books and newspapers	21 50
Telegrams and telephone	39 24
Steers purchased for feeding experiments	1,434 00
Drainage and drain tiles	98 25
	$ 14,279 44
LESS—Proceeds of sale of steers purchased for feeding experiments	2,203 03
	$ 12,076 41

EXPERIMENTAL FARM, BRANDON, MANITOBA—EXPENDITURE, 1900–1901.

Live stock	$ 30 89
Feed for stock, including veterinary services	71 65
Seed grain, seeds, trees, &c	111 04
Implements, tools, hardware and supplies	248 30
Travelling expenses	30 55
Exhibition expenses	193 00
Blacksmithing, harness supplies and repairs	255 18
Bee department	2 00
Salary of superintendent, also proportion of salaries for general work, Ottawa	2,617 81
Wages, farm work, including experimental work, with farm crops, &c	2,560 30
Wages, care of stock	872 25
Chemical department, proportion chargeable to each branch farm	690 82
Botanical and entomological department, proportion chargeable to each branch farm	525 00
Horticultural department	252 82
Forestry department, including care of grounds	474 50
Poultry department	50 90
Office help, including delivery of mail, $121.00	798 00
Seed grain distribution	528 24
Tree distribution	270 76
Contingencies, including postage, $55.00	99 31
Printing and stationery	45 67
Books and newspapers	20 40
Telegrams and telephones	54 30
Steers purchased for feeding experiments	562 25
	$ 11,365 94
LESS—Proceeds of sale of steers purchased for feeding experiments	872 19
	$ 10,493 75

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.—EXPENDITURE, 1900–1901.

Live stock	$ 20 00
Feed for stock, including veterinary services	49 25
Seed grain, seeds, trees, &c	64 10
Implements, tools, hardware and supplies	271 61
Travelling expenses	32 85
Exhibition expenses	46 75
Blacksmithing, harness supplies and repairs	139 75
Salary of superintendent, also proportion of salaries for general work, Ottawa	2,617 81
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c	2,816 22
Wages, care of stock	808 50
Chemical department, proportion chargeable to each branch farm	690 82
Botanical and entomological department, proportion chargeable to each branch farm	525 00
Horticultural department	386 30
Poultry department	67 10
Forestry department, including care of grounds	211 67
Office help	612 33
Seed grain distribution	448 34
Tree distribution	204 27
Contingencies, including postage, $105.82	130 17
Printing and stationery	45 60
Telegrams	34 23
Books and newspapers	14 00
Steers purchased for feeding experiments	597 90
	$ 10,834 57
LESS—Proceeds of sale of steers	1,204 40
	$ 9,630 17

EXPERIMENTAL FARM, AGASSIZ, B.C.—EXPENDITURE, 1900–1901.

Live stock		123 37
Feed for stock, including veterinary services		60 59
Seed grain, seeds, trees, etc.		231 76
Implements, tools, hardware and supplies		190 97
Manure and fertilizers		180 94
Travelling expenses		74 25
Exhibition expenses		130 75
Blacksmithing, harness supplies and repairs		124 70
Salary of superintendent, also proportion of salaries for general work, Ottawa		2,517 81
Wages, farm work, including experimental work with farm crops, fruit trees, vines, &c		2,315 66
Wages care of stock		417 25
Chemical department, proportion chargeable to each branch farm		690 82
Botanical and entomological department, proportion chargeable to each branch farm		525 00
Poultry department		149 95
Forestry department		197 40
Office help		120 00
Seed grain distribution		173 48
Tree distribution		19 19
Clearing land		477 00
Contingencies, including postage, $65.23		102 97
Printing and stationery		3 65
Books and newspapers		19 00
Telegrams		2 65
Drainage and drain tiles		357 86
Bee department		1 00
Steers purchased for feeding experiments		75 00
		$ 9,283 02
Less—Proceeds of sale of steers		484 00
		$ 8,799 02

SUMMARY.

Central Experimental Farm		$ 35,102 69
Nappan "		12,076 41
Brandon "		10,493 75
Indian Head "		9,630 17
Agassiz "		8,799 02
Seed grain distribution from Central Experimental Farm		3,897 96
Printing bulletins and distribution of bulletins and reports.	$ 5,500 00	
Less special sum in estimates for this item	5,500 00	
		$ 80,000 00

SUMMARY OF STOCK, MACHINERY, IMPLEMENTS, &c., ON HAND DECEMBER 31, 1901.

CENTRAL EXPERIMENTAL FARM, OTTAWA.

19 Horses	$ 2,335 00
9 Ayrshire cattle	1,775 00
9 Guernsey cattle	1,540 00
9 Durham cattle (Shorthorns)	2,140 00
30 Grade cattle	600 00
8 Yorkshire swine	245 00
11 Berkshire swine	243 00
3 Tamworth swine	110 00
18 Grade swine	180 00
4 Large black swine	100 00
18 Shropshire sheep	810 00
11 Leicester sheep	275 00
7 Grade sheep	35 00
Farm machinery and implements	2,780 50
Vehicles, including farm wagons and sleighs	1,158 70
Hand tools, hardware and sundries	1,201 45
Harness	446 80
Dairy department, machinery, &c	618 85
Horticultural and forestry departments, implements, tools, &c	582 55
Botanical department, implements, tools, &c	9 95
Poultry department, 314 fowls	295 00
Poultry department, implements, furnishings, &c	98 11
Bees and apiarian supplies	483 28
Chemical department, apparatus and chemicals	1,985 00
Books in several departments	495 85
Greenhouse plants, supplies, &c	1,836 75
Furniture at Director's house	1,065 78
Office furniture and stationery	1,269 35
	24,715 92

EXPERIMENTAL FARM, NAPPAN, N.S.

6 Horses	$	715 00
7 Guernsey cattle		1,110 00
6 Holstein cattle		270 00
9 Ayrshire cattle		710 00
2 Jersey cattle		200 00
44 Grade cattle		1,212 00
2 Yorkshire swine		45 00
3 Berkshire swine		70 00
1 Tamworth swine		20 00
63 Grade swine		330 00
34 Sheep		296 00
38 Fowls		19 50
Bees and apiarian supplies		27 50
Vehicles, including farm wagons and sleighs		325 00
Farm machinery		560 00
Farm implements		218 50
Hand tools, hardware and sundries		394 72
Harness		186 50
Furniture for reception room and bedroom for visiting officials		157 50
Furniture supplies and books for office		90 00
		6,957 22

EXPERIMENTAL FARM, BRANDON, MANITOBA.

12 Horses	$	1,035 00
4 Ayrshire cattle		210 00
8 Durham cattle		640 00
1 Guernsey bull		100 00
1 Holstein cattle		30 00
6 Grade cattle		125 00
2 Tamworth swine		30 00
6 Berkshire swine		60 00
2 Yorkshire swine		30 00
4 Grade swine		12 00
68 Fowls		68 00
Bees and apiarian supplies		123 95
Vehicles, including farm wagons and sleighs		467 00
Farm machinery		992 00
Farm implements		610 00
Hand tools, hardware and sundries		633 50
Harness		216 50
Furniture for reception room and bedroom for visiting officials		161 55
Furniture supplies and books for office		286 80
		5,831 30

EXPERIMENTAL FARM, INDIAN HEAD, N.W.T.

13 Horses	$	1,310 00
1 Ayrshire bull		75 00
17 Durham cattle		1,545 00
1 Guernsey bull		75 00
18 Grade cattle		485 00
12 Berkshire swine		115 00
16 Tamworth swine		105 00
2 Yorkshire White swine		30 00
68 Fowls		47 00
Bees and apiarian supplies		33 75
Vehicles, including farm wagons and sleighs		498 50
Farm machinery		1,036 00
Farm implements		649 00
Hand tools, hardware and sundries		518 05
Harness		156 50
Furniture for reception room and bedroom for visiting officials		167 50
Furniture supplies and books for office		364 90
		7,211 20

EXPERIMENTAL FARM, AGASSIZ, B.C.

6 Horses	$	375 00
13 Durham cattle		900 00
6 Grade cattle		155 00
9 Dorset horned sheep		102 50
5 Berkshire swine		60 00
6 Tamworth swine		60 00
9 Grade swine		27 00
51 Fowls		51 00
Bees and apiarian supplies		33 05
Vehicles, including farm wagons		290 00
Farm machinery		533 55
Farm implements		117 00
Hand tools, hardware and sundries		202 60
Harness		72 25
Furniture for reception room and bedroom for visiting officials		136 40
Furniture supplies and books for office		159 50
		3,184 85

W. H. HAY, *Accountant.*

INDEX